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Lee et al.

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(54) **BACKLIGHT ASSEMBLY AND DISPLAY DEVICE HAVING THE SAME**

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(73) Assignee: **Samsung Electronics Co., Ltd.** (KR)

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F21V 7/04 (2006.01)

(52) **U.S. Cl.** **362/225**; 362/235; 362/244; 362/27; 362/600; 362/611

(58) **Field of Classification Search** 362/225, 362/227, 235, 244, 26, 27, 600, 611, 614, 362/631–634, 559, 561, 260, 812; 40/558; 349/58–69

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,712,981	A *	1/1973	Eargle, Jr.	362/216
5,675,484	A *	10/1997	Shimada	363/71
6,796,678	B2 *	9/2004	Moon	362/225
6,843,584	B2 *	1/2005	Bang et al.	362/249
6,916,102	B2 *	7/2005	Lin	362/634
2003/0142487	A1 *	7/2003	Fan	362/29
2004/0213018	A1 *	10/2004	Torihara	362/561
2005/0073858	A1 *	4/2005	Kim et al.	362/561
2005/0134183	A1 *	6/2005	Park et al.	315/58
2006/0126321	A1 *	6/2006	Lim	362/29

FOREIGN PATENT DOCUMENTS

JP	05166854	*	1/1995
JP	08003357	*	7/1997
JP	2001013512	*	1/2001

* cited by examiner

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(57) **ABSTRACT**

A backlight assembly includes at least one U-shaped lamp, a first connecting member, and a second connecting member. The U-shaped lamp includes a U-shaped lamp tube, a first external electrode covering a first end portion of the U-shaped lamp tube, and a second external electrode covering a second end portion of the U-shaped lamp tube. The U-shaped lamp tube generates light when a first driving voltage is applied to the first external electrode and a second driving voltage is applied to the second external electrode. The first connecting member is electrically connected to the first external electrode for applying the first driving voltage to the first external electrode. The second connecting member is electrically connected to the second external electrode for applying the second driving voltage to the second external electrode. Therefore, interference between a wire for applying power to the U-shaped lamp and the U-shaped lamp is reduced.

33 Claims, 15 Drawing Sheets

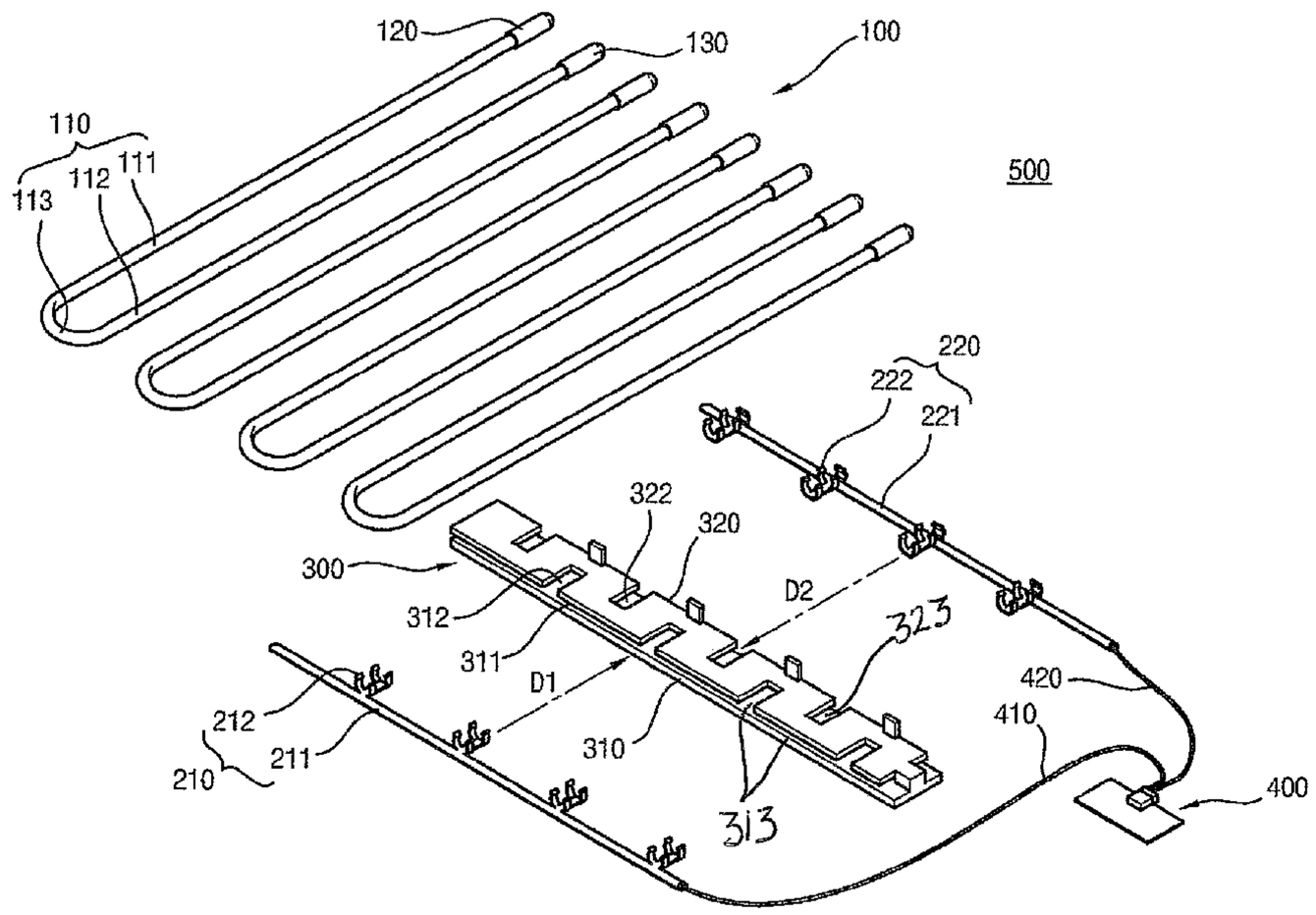


FIG. 1

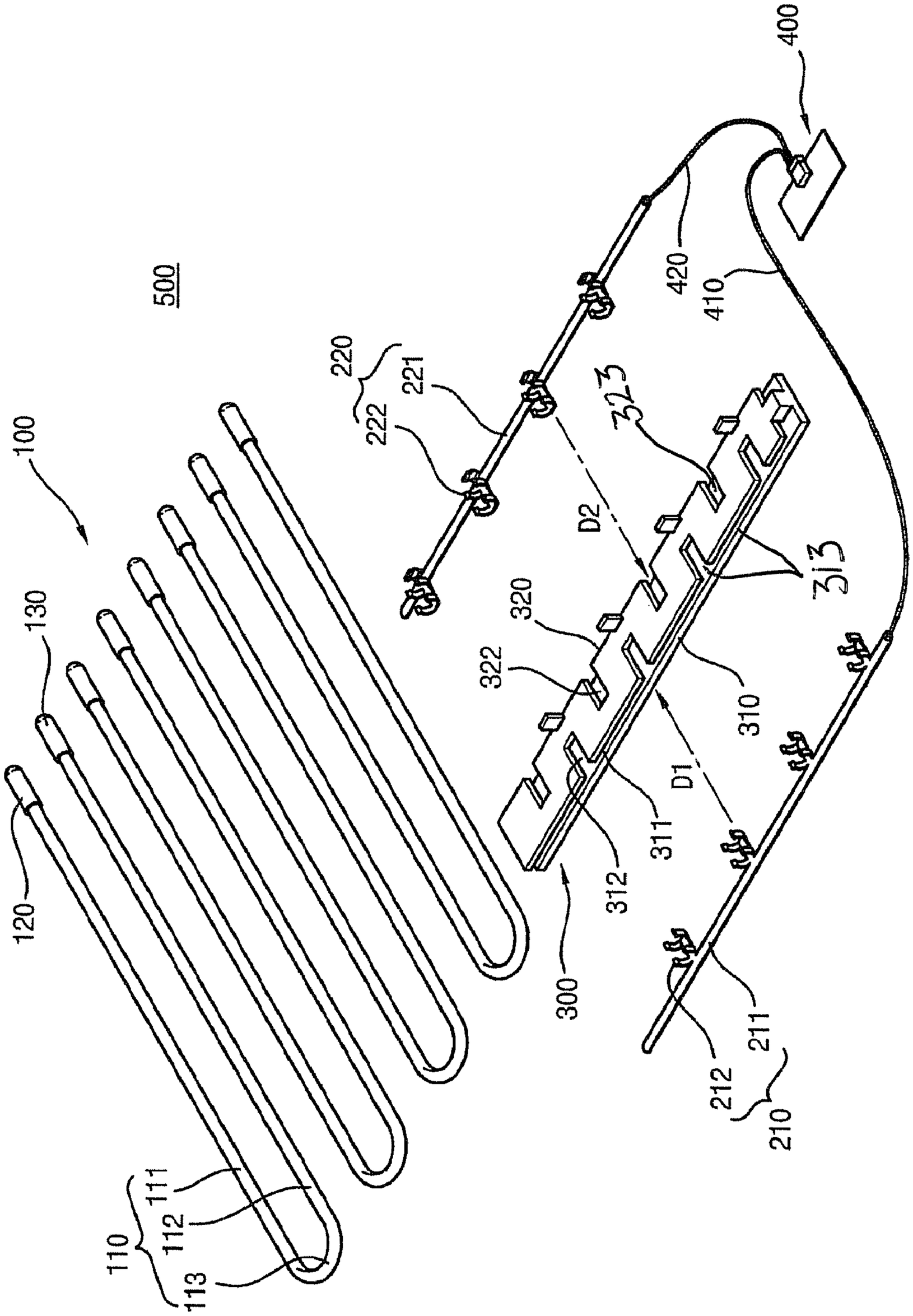

500
400
420
410
220
221
222
100
130
120
323
D2
320
322
313
310
311
D1
312
300
212
211
210
110
111
112
113

FIG. 2

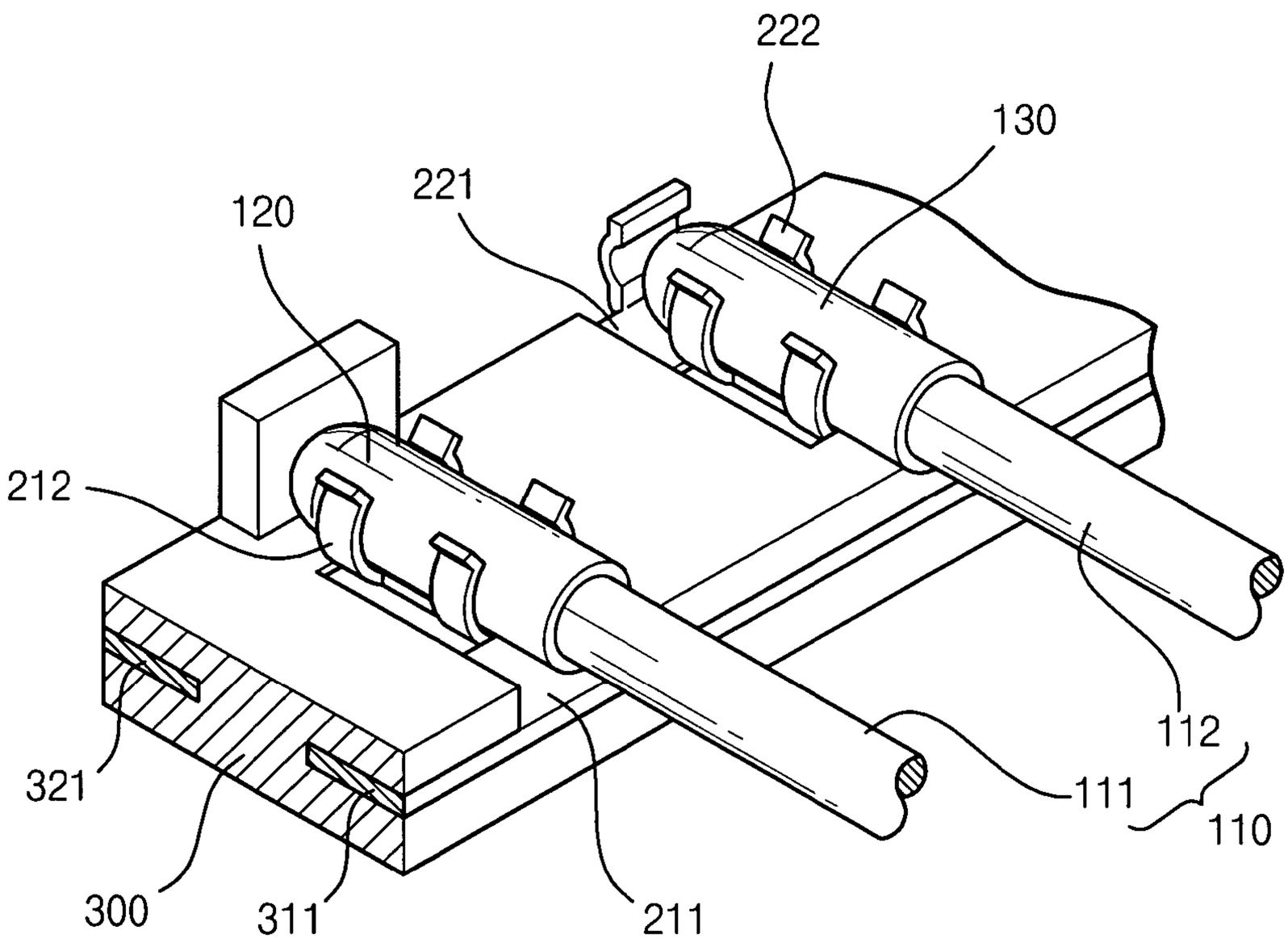


FIG. 3

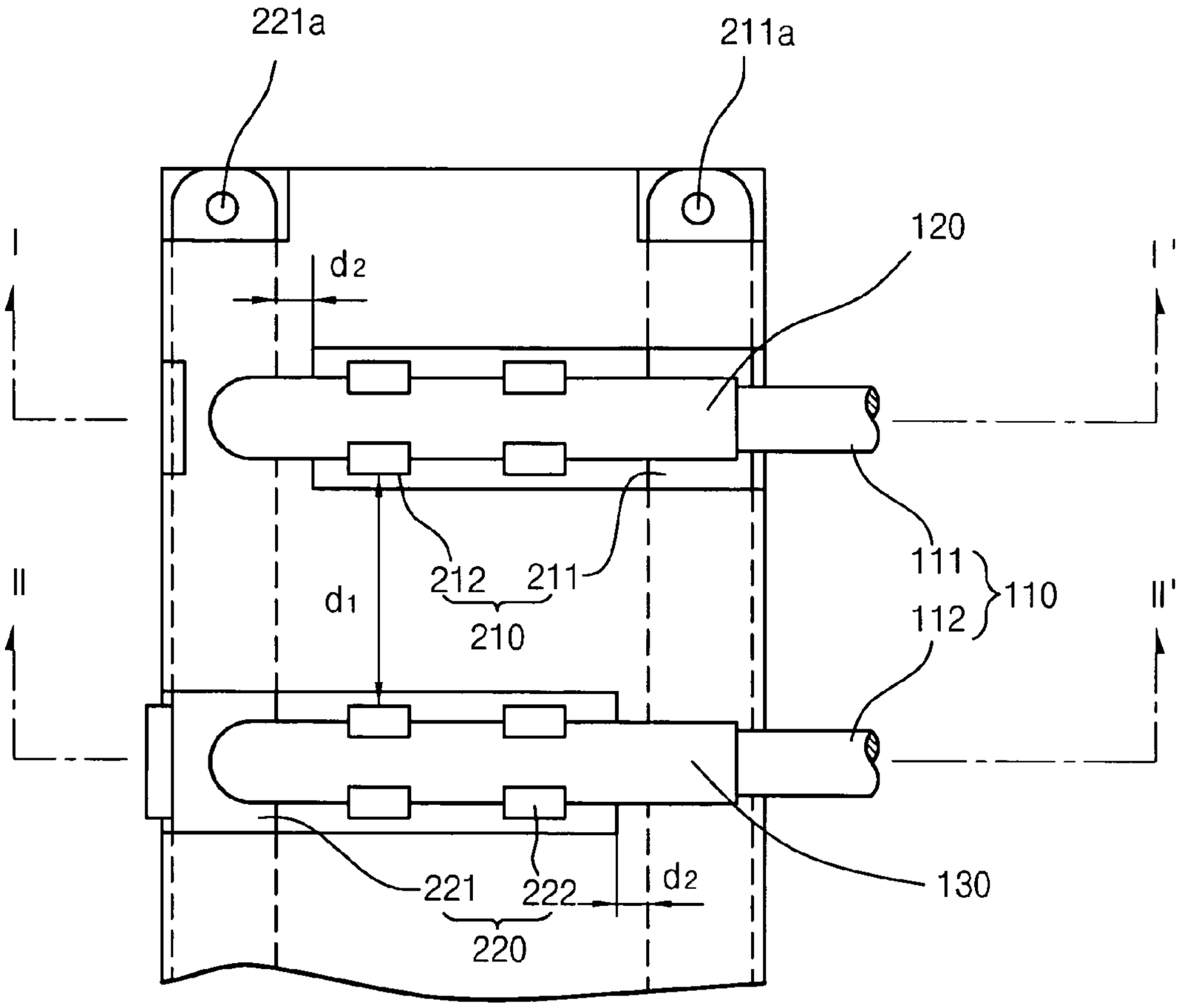

221a
211a
120
I
I'
d2
212
211
d1
210
111
112
110
II
II'
221
222
d2
220
130

FIG. 4

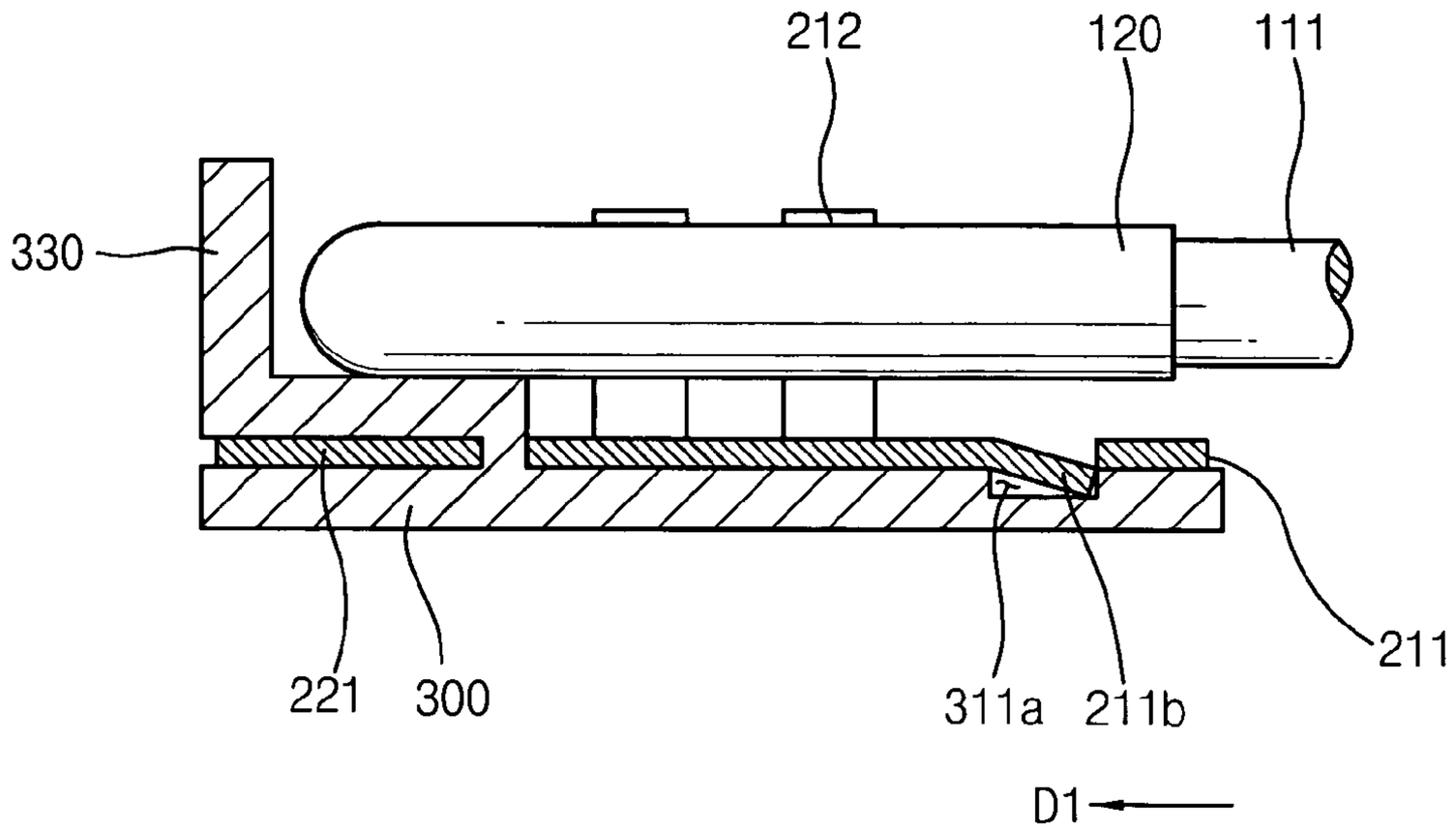

212
120
111
330
221
300
311a
211b
211
D1

FIG. 5

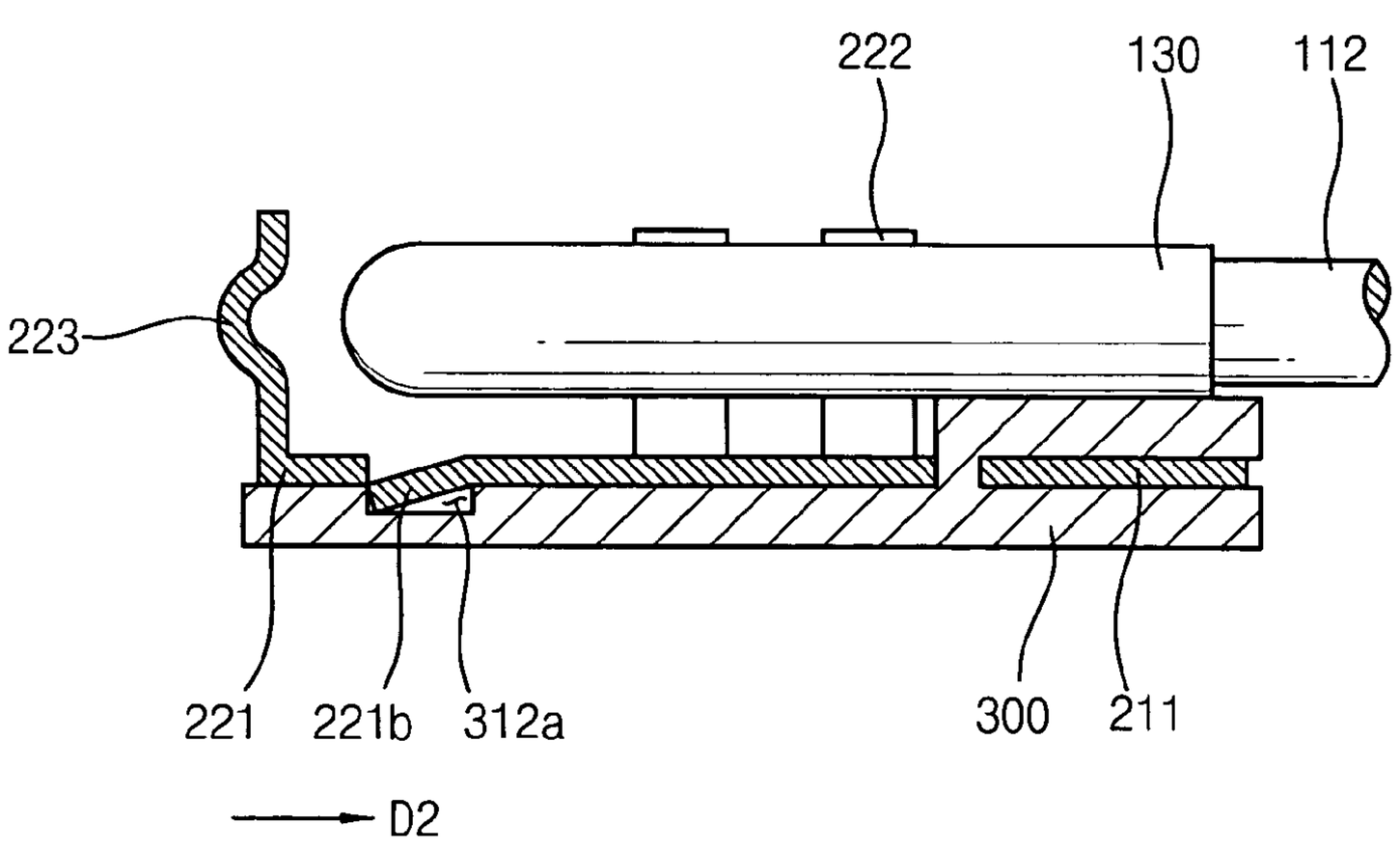

222
130
112
223
221
221b
312a
300
211
D2

FIG. 6

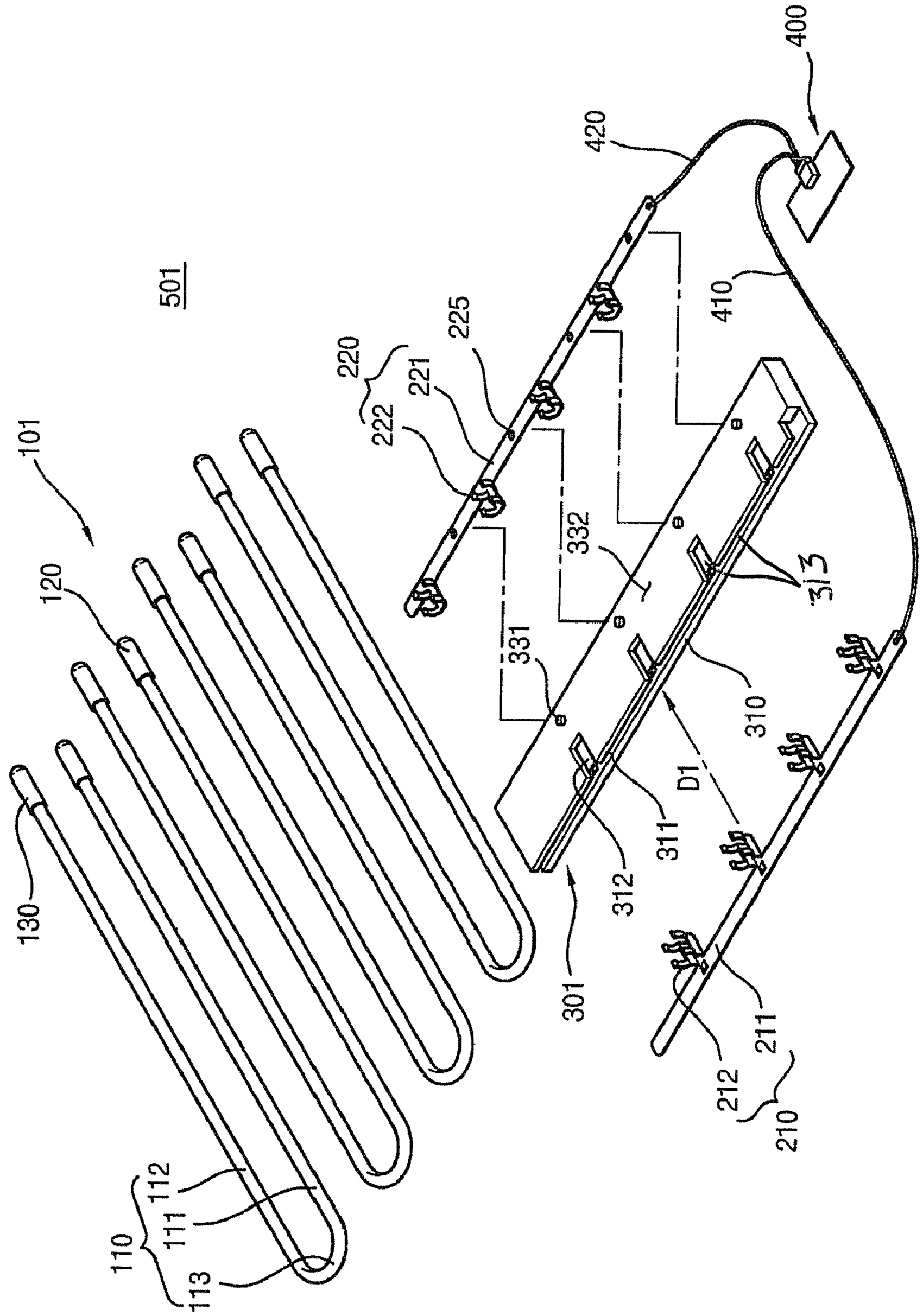

400
420
501
101
120
130
220
221
222
225
410
331
332
313
310
311
312
D1
301
212
211
210
110
111
112
113

FIG. 7

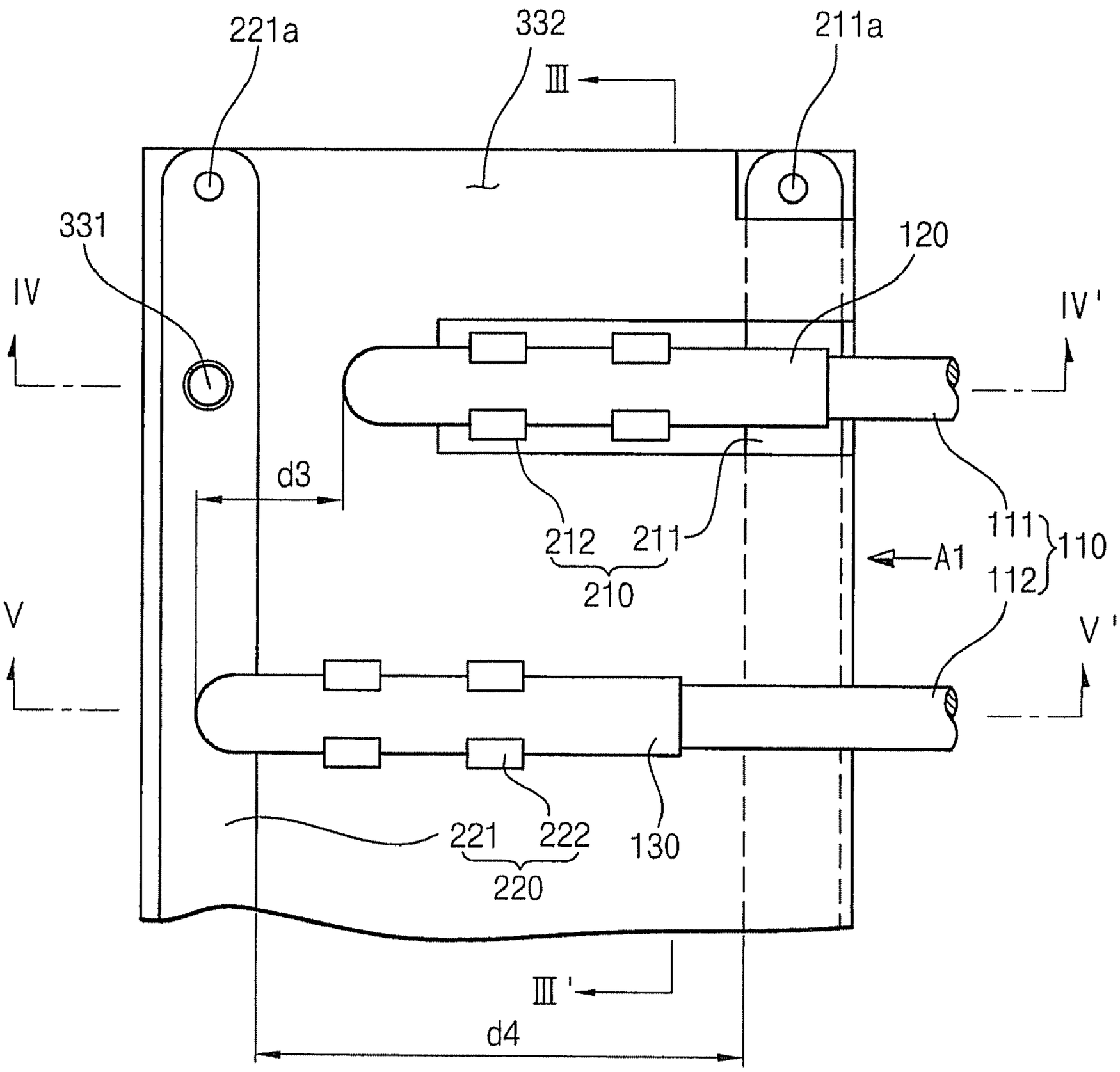

221a
332
III
211a
331
120
IV
IV'
d3
212
211
111
110
112
A1
210
V
V'
221
222
130
220
III'
d4

FIG. 8

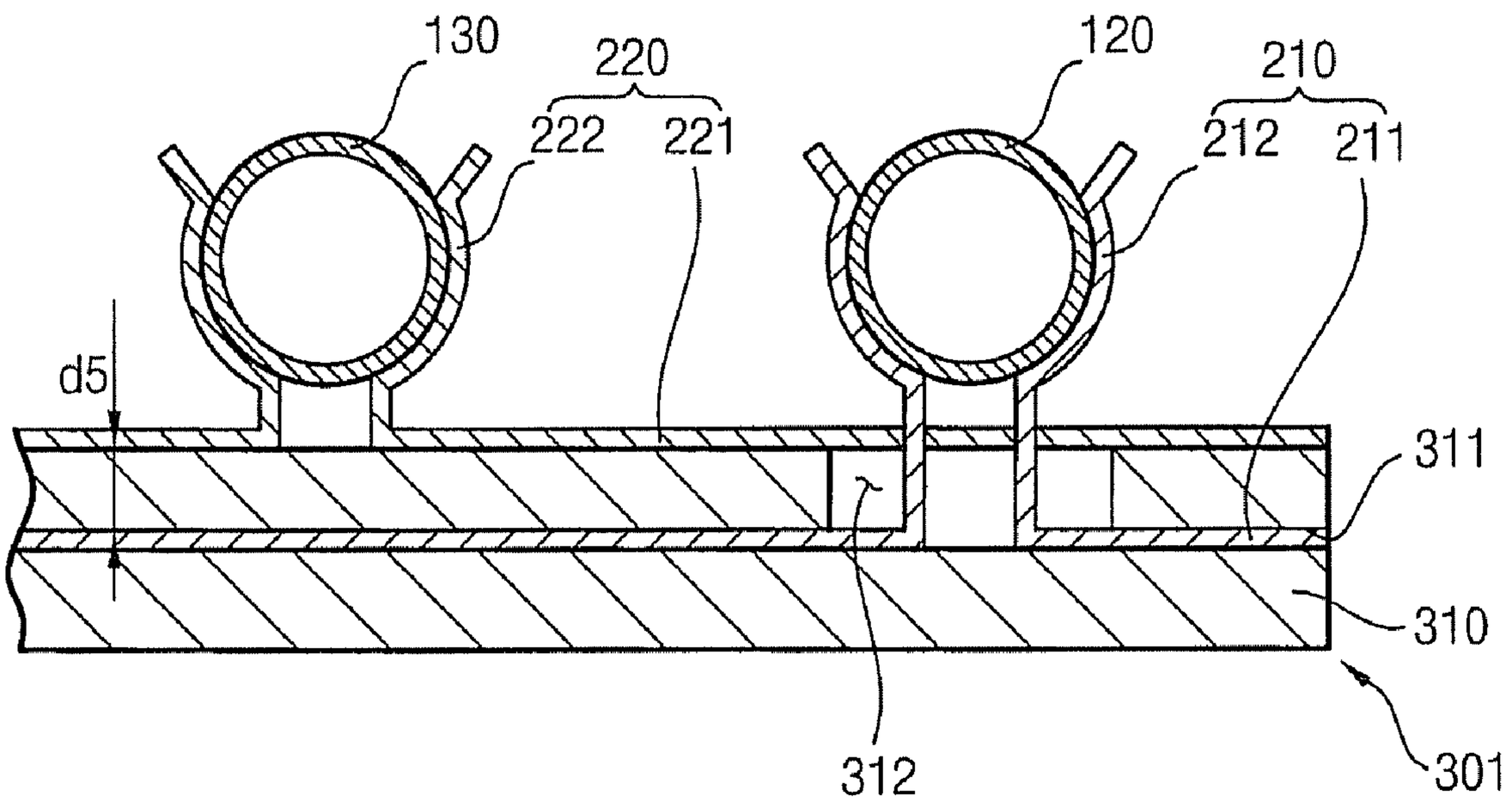


FIG. 9

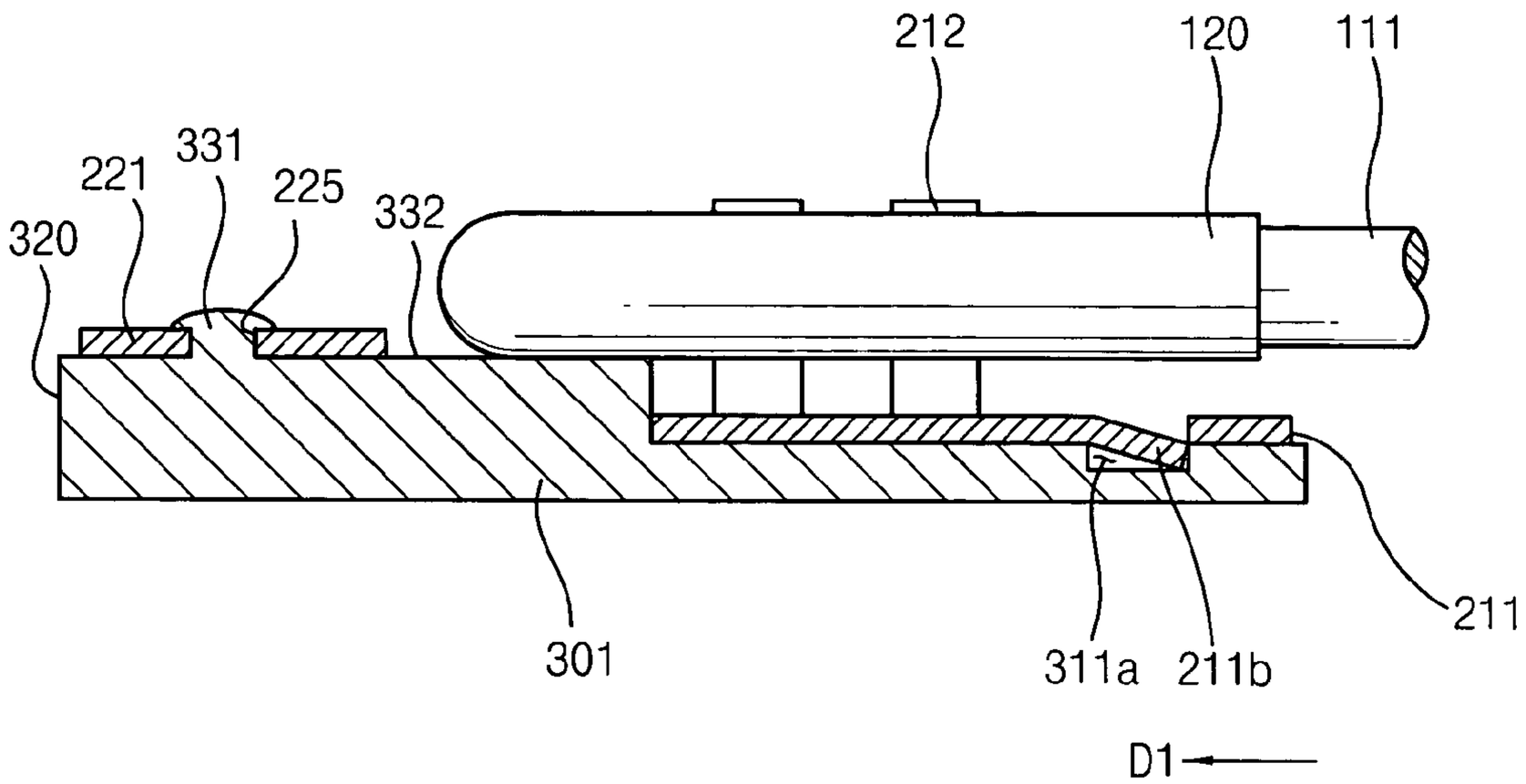

212
120
111
331
221
225
332
320
301
311a
211b
211
D1

FIG. 10

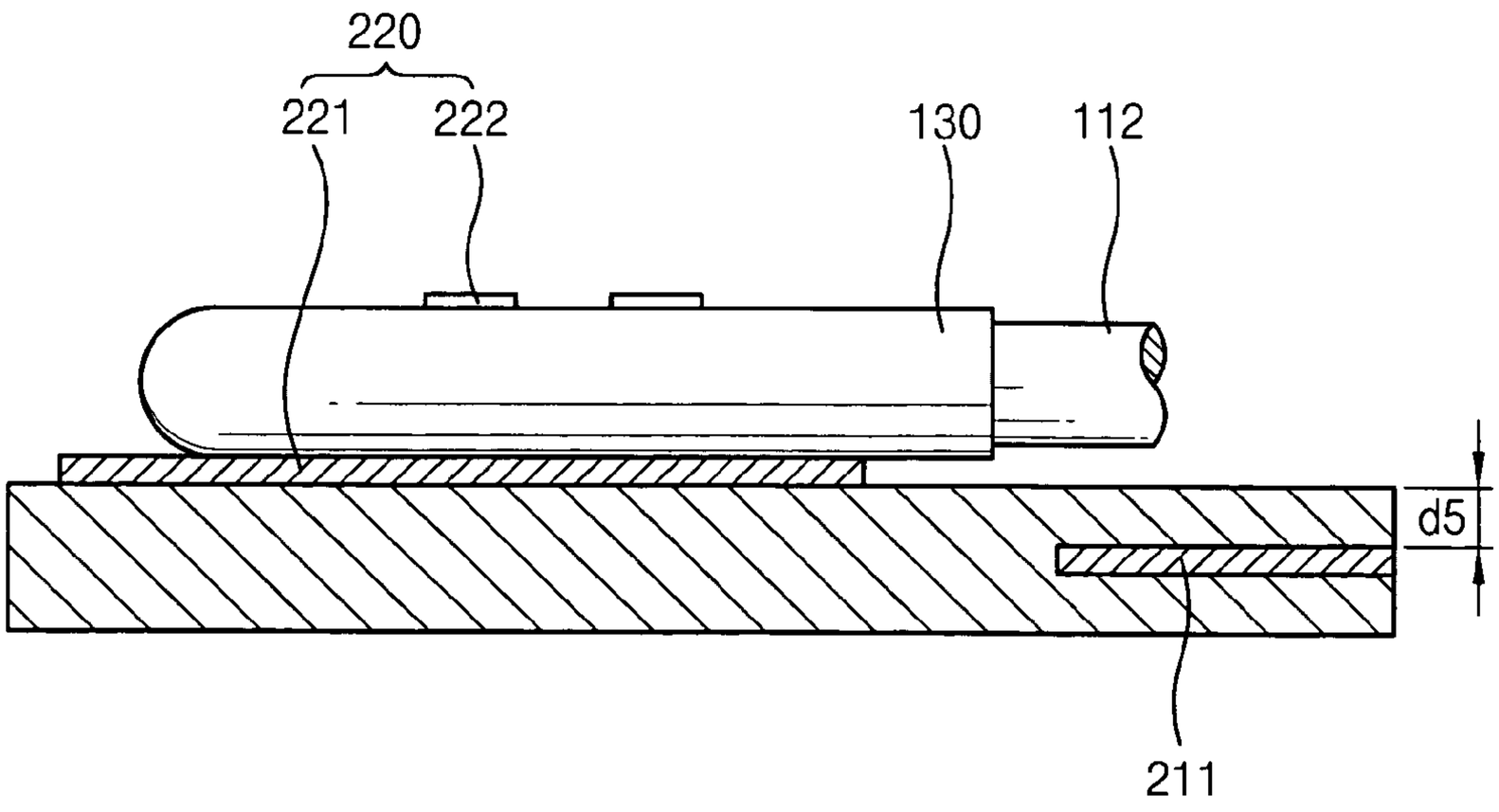

220
221
222
130
112
d5
211

FIG. 11

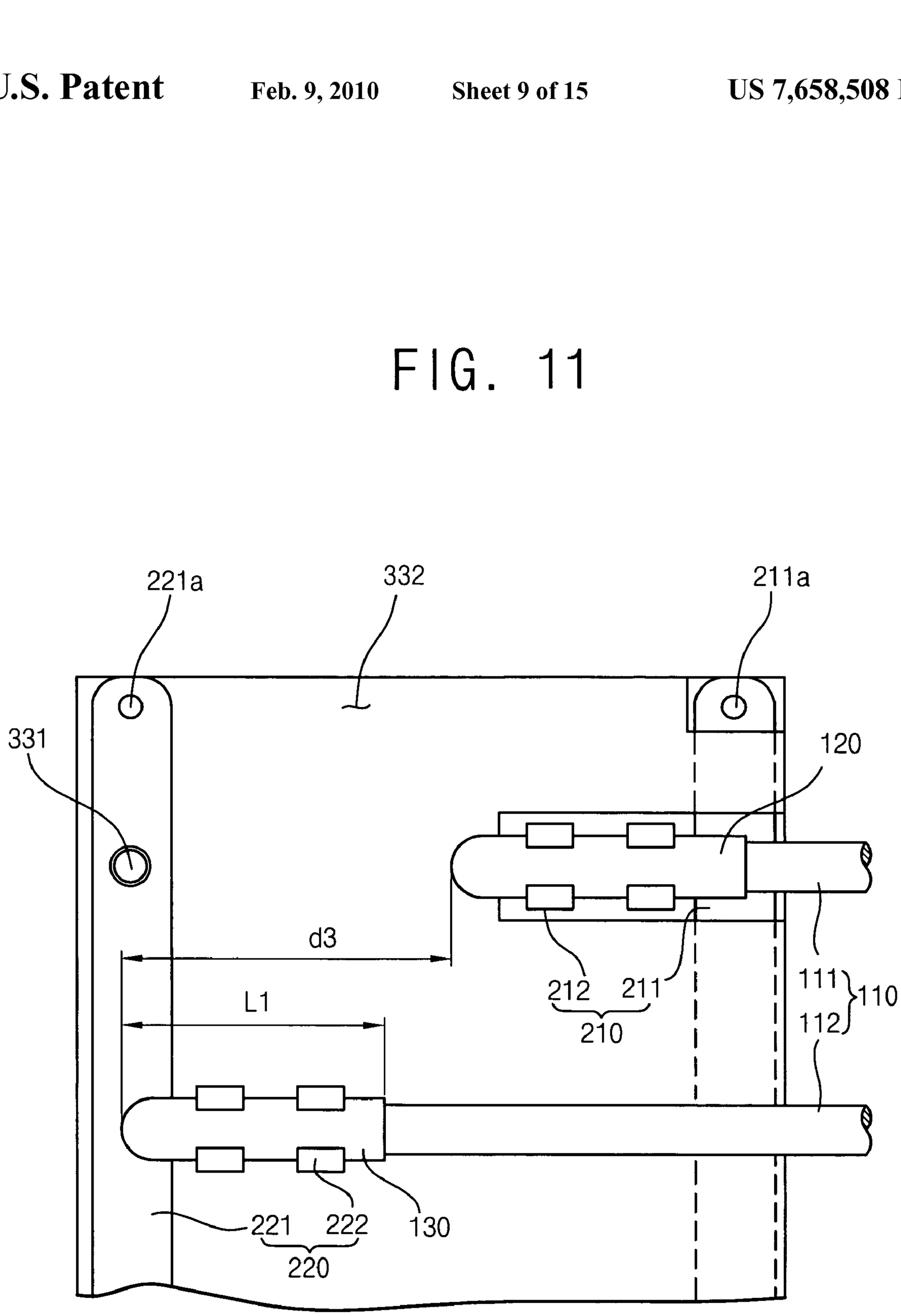

221a
332
211a
331
120
d3
L1
212
211
210
111
110
112
221
222
130
220

FIG. 12

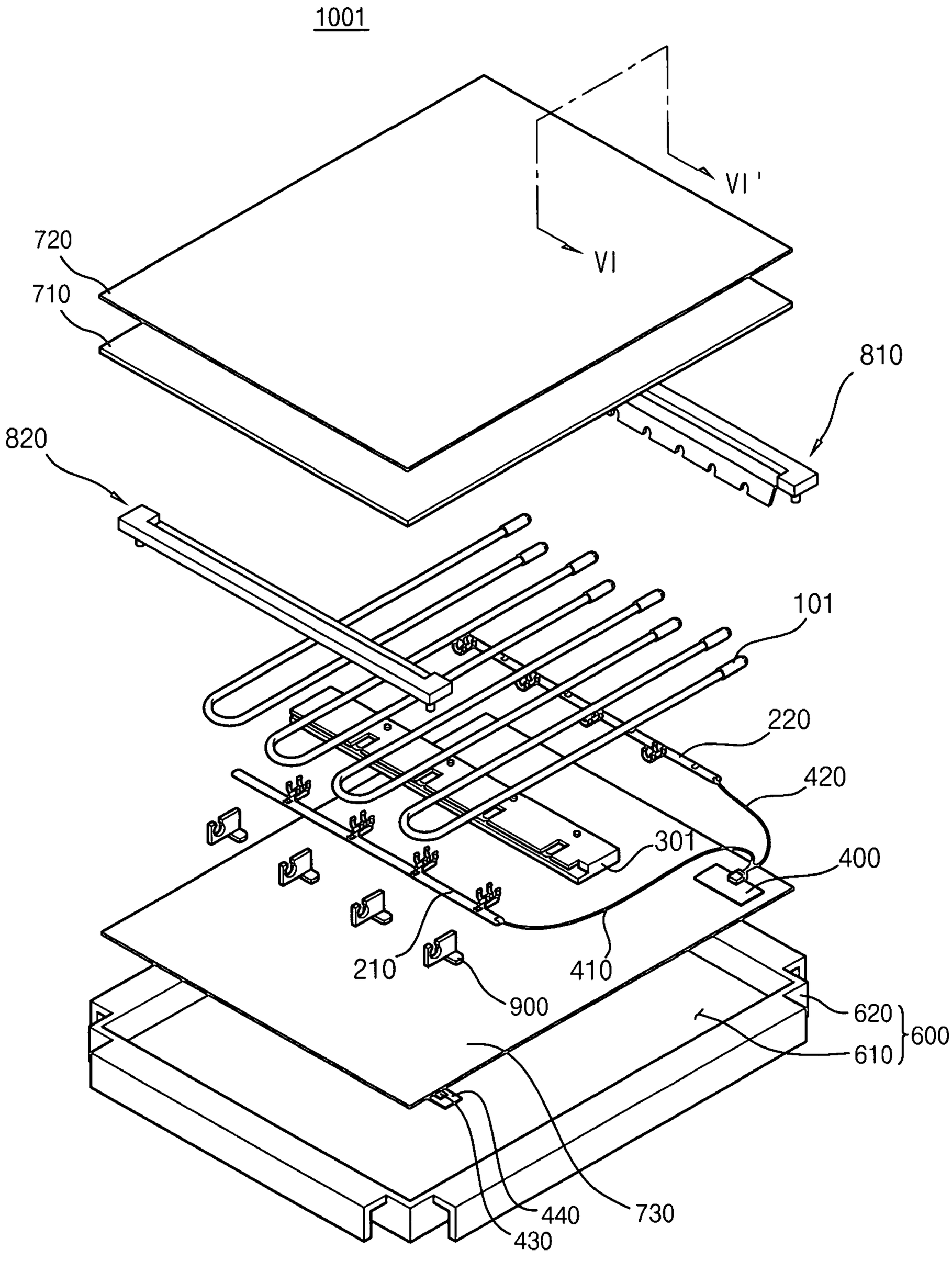
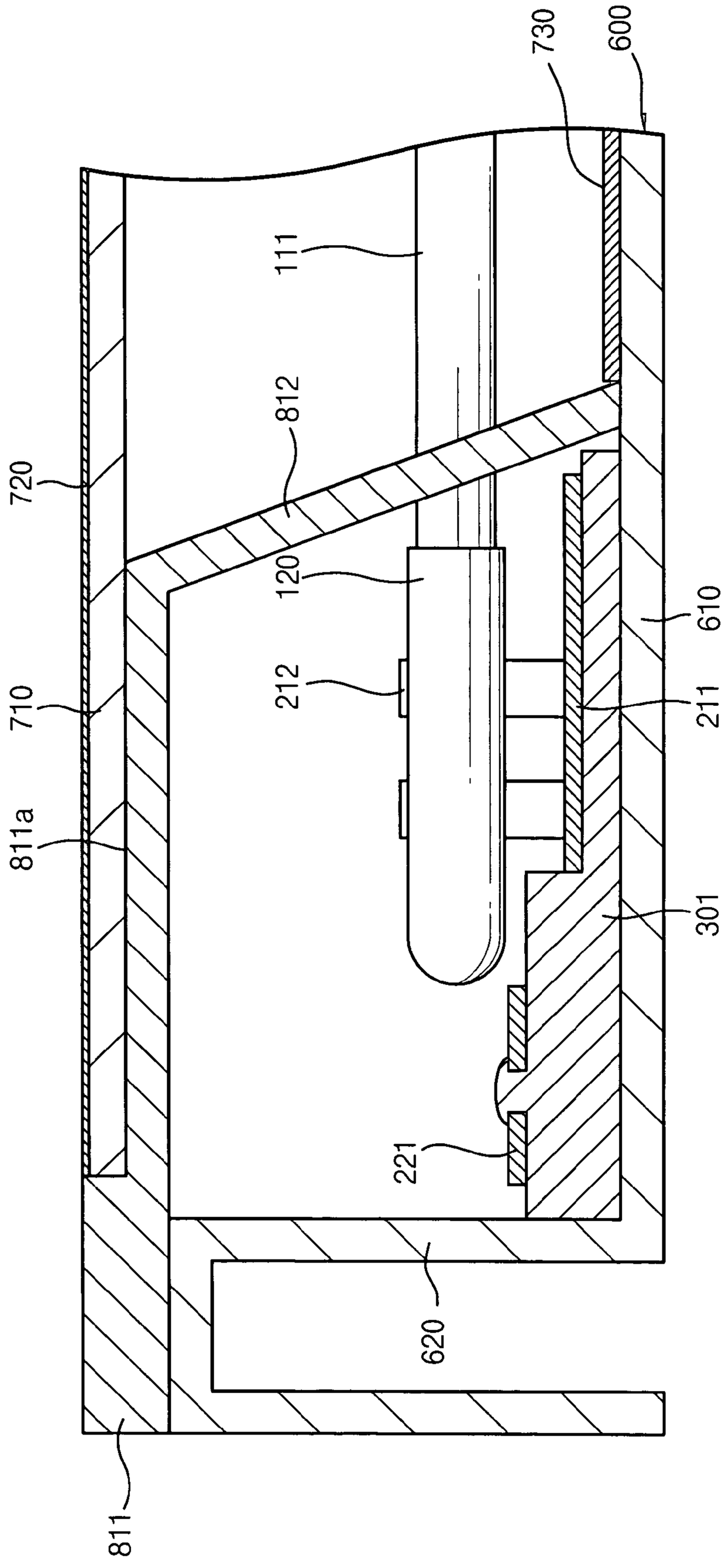

1001
VI'
VI
720
710
810
820
101
220
420
301
400
210
410
900
620
610
600
440
730
430

FIG. 13


1001
730
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111
812
720
120
610
212
710
211
811a
301
221
620
811

FIG. 14

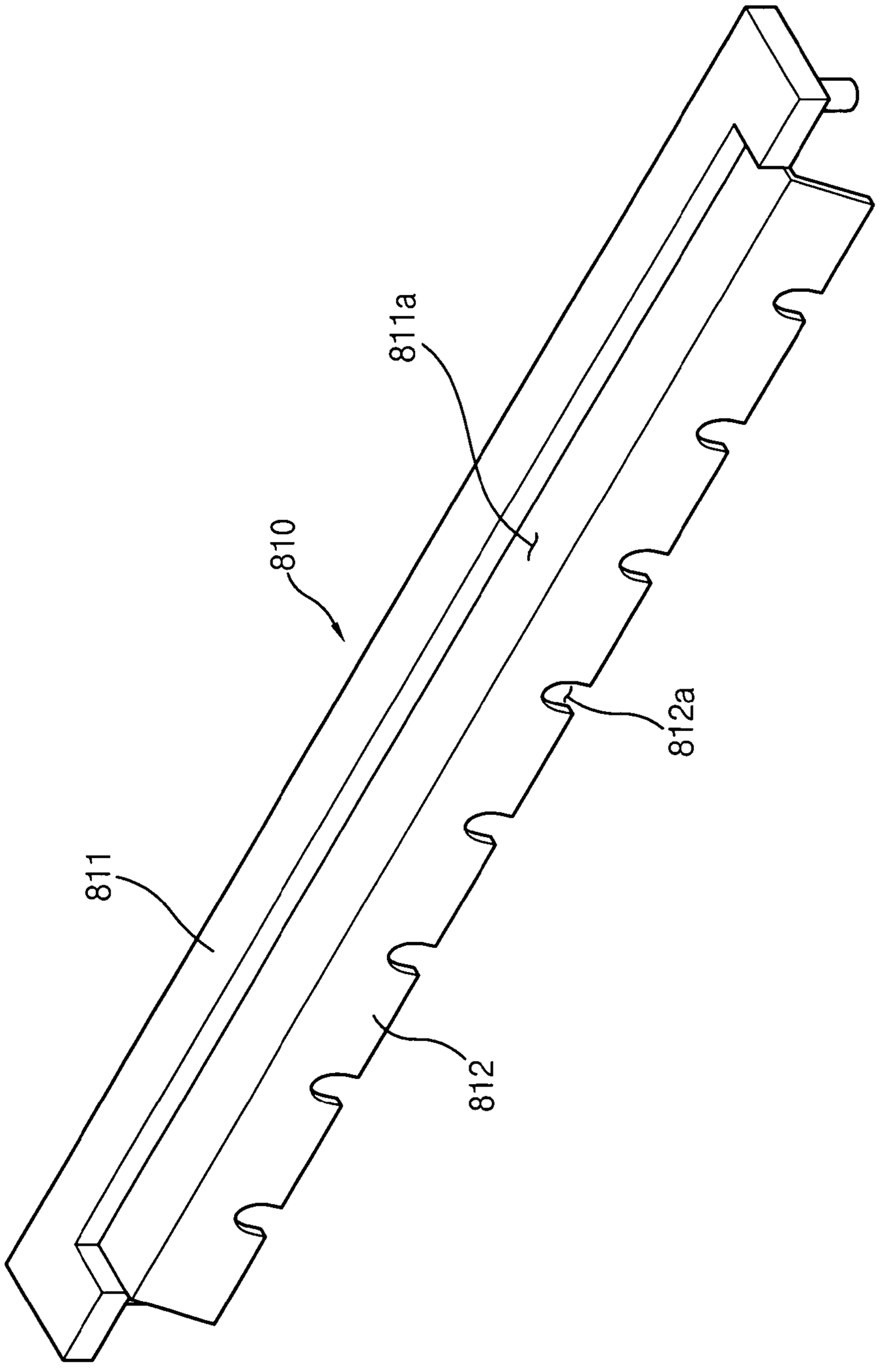


FIG. 15

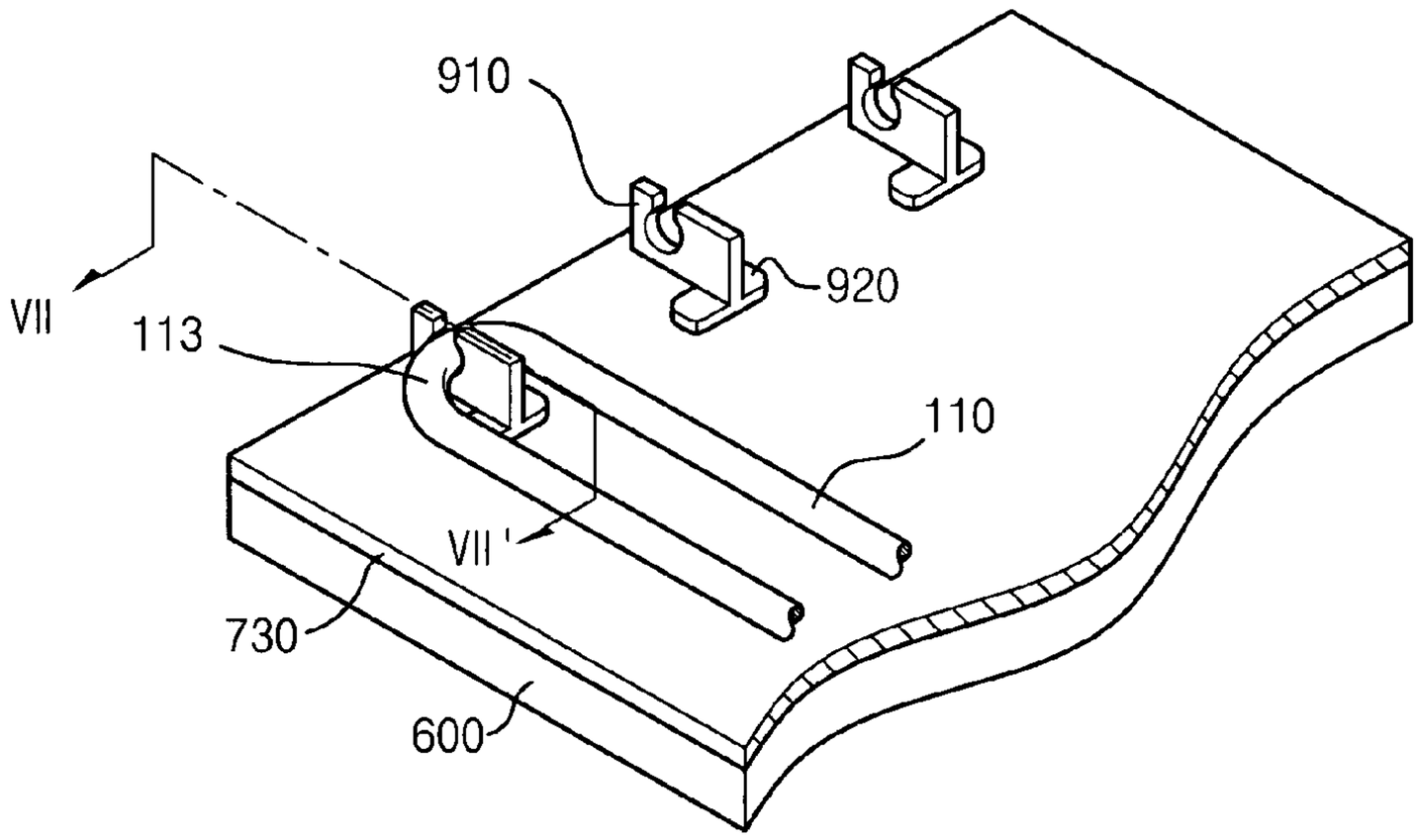

910
920
VII
113
110
VII'
730
600

FIG. 16

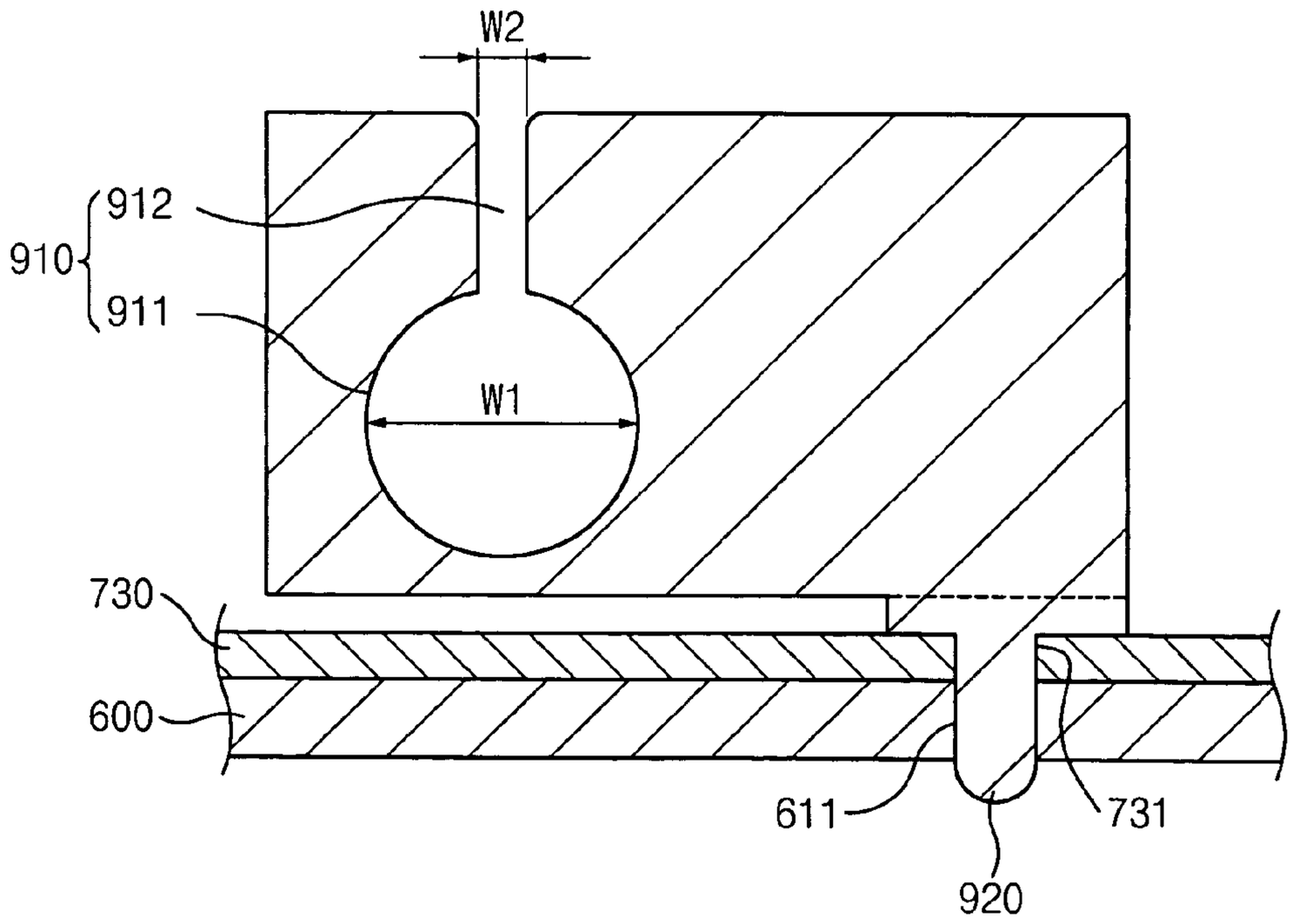

W2
912
910
911
W1
730
600
611
731
920

FIG. 17

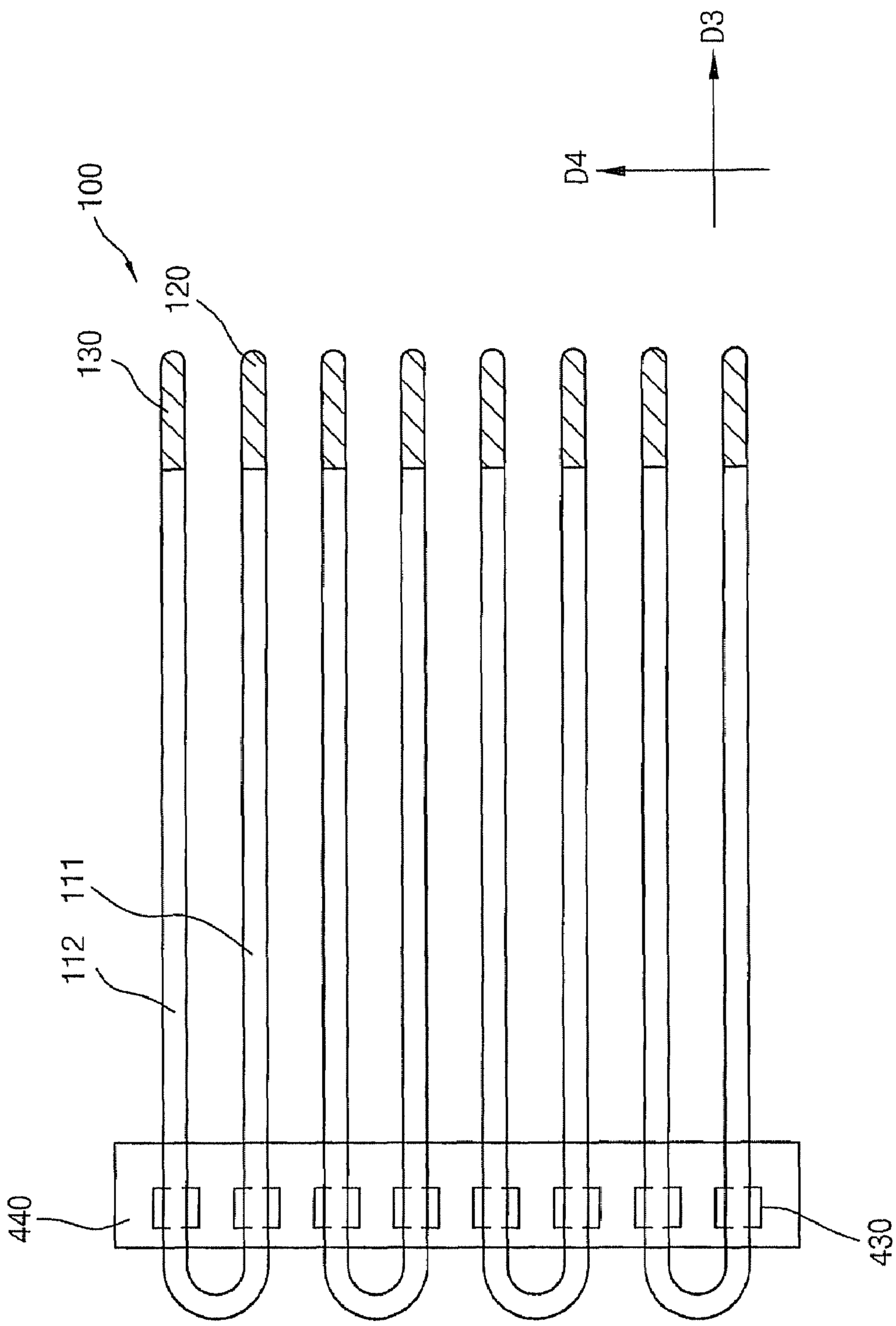
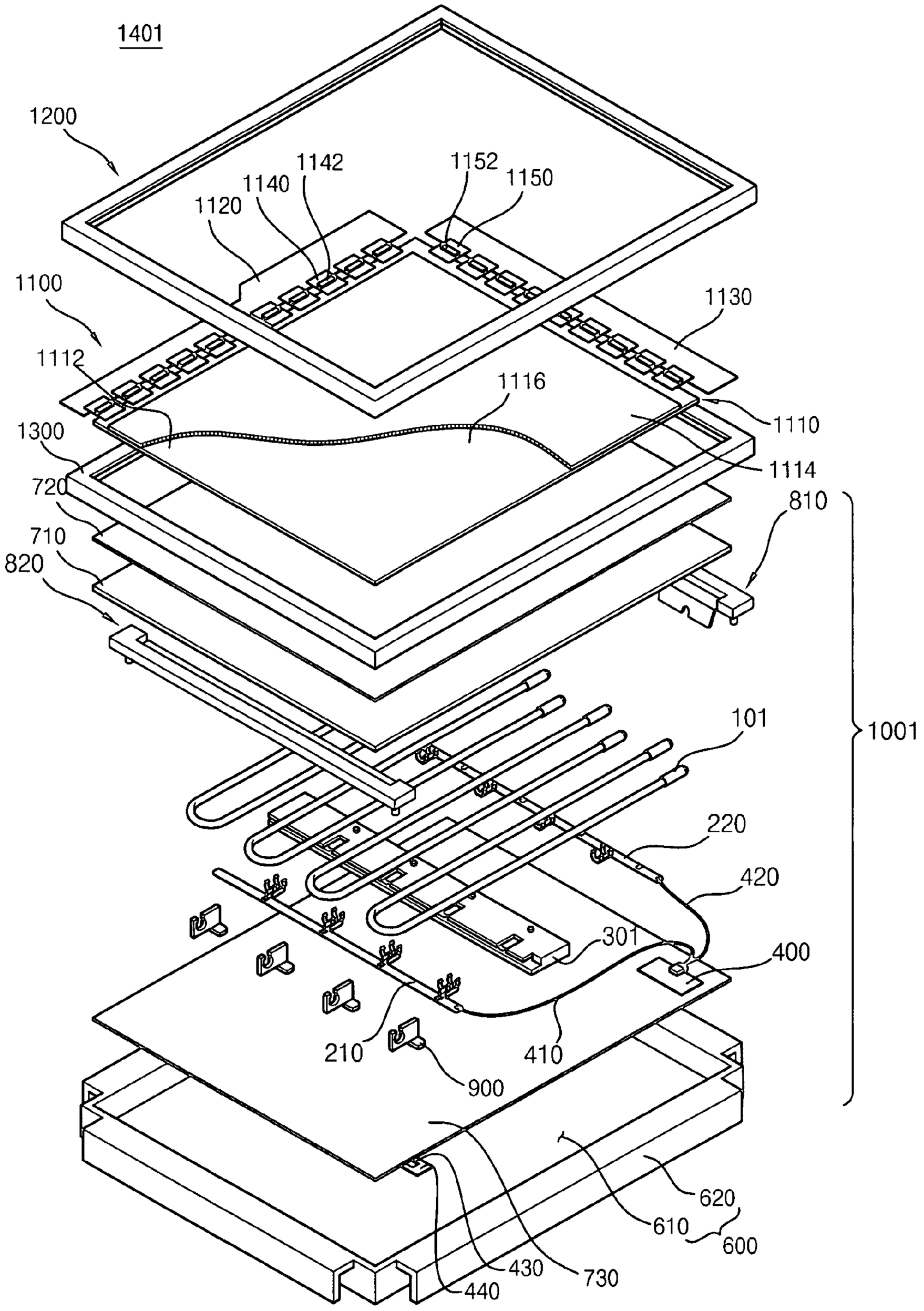


FIG. 18


1401
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1142
1152
1140
1150
1120
1100
1130
1112
1116
1110
1300
1114
720
810
710
820
101
1001
220
420
301
400
210
410
900
620
610
600
430
730
440

BACKLIGHT ASSEMBLY AND DISPLAY DEVICE HAVING THE SAME

This application claims priority to Korean Patent Application No. 2004-78271 filed on Oct. 1, 2004 and Korean Patent Application No. 2004-112984 filed on Dec. 27, 2004 and all the benefits accruing therefrom under 35 U.S.C. §119, and the contents of which in their entireties are herein incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a backlight assembly and a display device having the backlight assembly. More particularly, the present invention relates to a backlight assembly capable of enhancing productivity and reducing power consumption, and a display device having the backlight assembly.

2. Description of the Related Art

A liquid crystal display ("LCD") device includes an LCD panel for displaying an image and a backlight assembly for providing the LCD panel with light. As a size of the LCD panel increases, a size of the backlight assembly also increases. As a result, the LCD device employs a direct illumination type backlight assembly.

The direct illumination type backlight assembly includes a plurality of lamps. In general, the direct illumination type backlight assembly employs a plurality of cold cathode fluorescent lamps ("CCFLs") and therefore requires a plurality of inverters in order to drive the plurality of CCFLs that are electrically connected in parallel. As a result, cost for manufacturing the direction illumination type backlight assembly is increased and productivity is lowered.

Furthermore, the direction illumination type backlight assembly requires wires for electrically connecting the CCFLs to inverters. The inverters are disposed at a first end of each CCFL, so that a wire electrically connected to a second end of the CCFL, which is opposite to the first end, must extend back towards the first end and connect to the inverters to induce electromagnetic fields, and such an arrangement deteriorates luminance uniformity of the backlight assembly and increases power consumption.

BRIEF SUMMARY OF THE INVENTION

The present invention provides a backlight assembly capable of enhancing productivity and reducing power consumption.

The present invention also provides a display device having the above-described backlight assembly.

In exemplary embodiments of a backlight assembly, the backlight assembly includes at least one U-shaped lamp, a first connecting member and a second connecting member. Each U-shaped lamp includes a U-shaped lamp tube, a first external electrode covering a first end portion of the U-shaped lamp tube, and a second external electrode covering a second end portion of the U-shaped lamp tube. The U-shaped lamp tube generates light when a first driving voltage is applied to the first external electrode and a second driving voltage is applied to the second external electrode. The first connecting member is electrically connected to each first external electrode for applying the first driving voltage to the first external electrode. The second connecting member is electrically connected to each second external electrode for applying the second driving voltage to the second external electrode.

In exemplary embodiments of a display device, the display device includes a display panel and a backlight assembly. The display panel displays an image by using light. The backlight assembly provides the display panel with the light. The backlight assembly includes at least one U-shaped lamp, a first connecting member and a second connecting member. Each U-shaped lamp includes a U-shaped lamp tube, a first external electrode covering a first end portion of the U-shaped lamp tube, and a second external electrode covering a second end portion of the U-shaped lamp tube. The U-shaped lamp tube generates light when a first driving voltage is applied to the first external electrode and a second driving voltage is applied to the second external electrode. The first connecting member is electrically connected to each first external electrode for applying the first driving voltage to the first external electrode. The second connecting member is electrically connected to each second external electrode for applying the second driving voltage to the second external electrode.

In other exemplary embodiments of a backlight assembly, the backlight assembly includes a plurality of lamps and a single inverter electrically connected to the plurality of lamps, wherein the inverter provides first and second driving voltages to each lamp within the plurality of lamps. According to embodiments of the present invention, the backlight assembly employs only one inverter for driving a plurality of U-shaped lamps electrically connected in parallel to enhance productivity.

Furthermore, the first and second wires for connecting the U-shaped lamp to the inverter are disposed at one side of the backlight assembly, so that interference between the wires and the U-shaped lamp is reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features and advantages of the present invention will become more apparent by describing in detailed exemplary embodiments thereof with reference to the accompanying drawings, in which:

FIG. **1** is an exploded perspective view illustrating an exemplary embodiment of a backlight assembly according to the present invention;

FIG. **2** is a perspective view illustrating a portion of the backlight assembly in FIG. **1**;

FIG. **3** is a plan view illustrating the portion of the backlight assembly in FIG. **2**;

FIG. **4** is a cross-sectional view taken along line I-I' in FIG. **3**;

FIG. **5** is a cross-sectional view taken along line II-II' in FIG. **3**;

FIG. **6** is an exploded perspective view illustrating another exemplary embodiment of a backlight assembly according to the present invention;

FIG. **7** is a plan view illustrating a portion of the backlight assembly in FIG. **6**;

FIG. **8** is a cross-sectional view taken along line III-III' in FIG. **7**;

FIG. **9** is a cross-sectional view taken along line IV-IV' in FIG. **7**;

FIG. **10** is a cross-sectional view taken along line V-V' in FIG. **7**;

FIG. **11** is a plan view illustrating another exemplary embodiment of a backlight assembly according to the present invention;

FIG. **12** is an exploded perspective view illustrating another exemplary embodiment of a backlight assembly according to the present invention;

FIG. **13** is a cross-sectional view taken along line VI-VI' in FIG. **12**;

FIG. **14** is a perspective view illustrating a first mold cover in FIG. **12**;

FIG. **15** is a perspective view illustrating a fixing member in FIG. **12**;

FIG. **16** is a cross-sectional view taken along a line VII-VII' in FIG. **15**;

FIG. **17** is a plan view illustrating a connection between a sensor and a U-shaped lamp; and

FIG. **18** is an exploded perspective view illustrating an exemplary embodiment of an LCD device according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

It should be understood that the exemplary embodiments of the present invention described below may be varied and modified in many different ways without departing from the inventive principles disclosed herein, and the scope of the present invention is therefore not limited to these particular embodiments. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the concept of the invention to those skilled in the art by way of example and not of limitation.

Hereinafter, the embodiments of the present invention will be described in detail with reference to the accompanied drawings. In the drawings, the thickness of layers, films, and regions are exaggerated for clarity. Like numerals refer to like elements throughout. It will be understood that when an element such as a layer, film, region, or substrate is referred to as being "on" another element, it can be directly on the other element or intervening elements may also be present.

FIG. **1** is an exploded perspective view illustrating an exemplary embodiment of a backlight assembly according to the present invention, and FIG. **2** is a perspective view illustrating a portion of the backlight assembly in FIG. **1**.

Referring to FIGS. **1** and **2**, a backlight assembly **500** includes a plurality of U-shaped lamps **100**, a first electrode plate **210**, a second electrode plate **220**, a mold frame **300**, and an inverter **400**.

Each of the U-shaped lamps **100** includes a U-shaped lamp tube **110**, a first external electrode **120**, and a second external electrode **130**. The U-shaped lamp tube **110** includes a first light-emitting portion **111**, a second light-emitting portion **112**, and a rounded portion **113**. The first and second light-emitting portions **111** and **112** are extended along a first direction D**1**, and substantially in parallel with each other. The rounded portion **113** connects the first and second light-emitting portions **111** and **112** to each other. That is, the rounded portion **113** may be generally C-shaped, with a first end of the rounded portion **113** connected to the first light-emitting portion **111** and a second end of the rounded portion **113** connected to the second light-emitting portion **112**.

The first external electrode **120** covers a first end portion of the first light-emitting portion **111**, and the second external electrode **130** covers a first end portion of the second light-emitting portion **112**. The first end portion of the first light-emitting portion **111** may correspond to a first end of the U-shaped lamp tube **110** and the first end portion of the second light-emitting portion **112** may correspond to a second end of the U-shaped lamp tube **110**. The second end portion of the first light-emitting portion **111** is connected to the first end of the rounded portion **113** and the second end portion of the second light-emitting portion **112** is connected to the second end of the rounded portion **113**.

The first electrode plate **210** includes a first base substrate **211** and a plurality of first clips **212**. The first base substrate **211** is extended along a third direction that is substantially perpendicular to the first direction D**1**. In other words, a longitudinal direction corresponding to a longitudinal axis of the first base substrate **211** is substantially perpendicular to a longitudinal direction corresponding to longitudinal axes of the first and second light-emitting portions **111** and **112**. The first clips **212** are upwardly protruded and combined with the first end portion of the first light-emitting portion **111**, so that the first light-emitting portion **111** is fixed relative to the first electrode plate **210** within the backlight assembly **500**. The first clips **212** are spaced apart from each other by a distance substantially equal to a distance between first light emitting portions **111** of adjacent U-shaped lamps **100**. In the illustrated embodiment, the first clips **212** include a clip supporting prong extending perpendicularly to the first base substrate **211** and two lamp-holding members, although more or less lamp holding members would be within the scope of the first clips **212**. The lamp-holding members are generally C-shaped where an opening of the C-shape is less than a diameter of the first light-emitting portion **111**. The lamp holding members may be spring biased C-Shaped clips such that the opening of the lamp-holding members may be expanded for receiving the first light-emitting portion **111**, and may be biased back to enclose the first light-emitting portion **111** therein. While a particular exemplary embodiment of the first clips **212** is illustrated, it should be understood that alternate embodiments of the first clips **212** would be within the scope of the first electrode plate **210**.

The second electrode plate **220** includes a second base substrate **221** and a plurality of second clips **222** that may be similar to the first clips **212**. The second base substrate **221** is extended along the third direction that is substantially perpendicular to the first direction D**1**. In other words, a longitudinal direction corresponding to a longitudinal axis of the second base substrate **221** is substantially perpendicular to a longitudinal direction corresponding to longitudinal axes of the first and second light-emitting portions **111** and **112**. The second clips **222** are upwardly protruded and combined with the first end portion of the second light-emitting portion **112**, so that the second light-emitting portion **112** is fixed relative to the second electrode plate **220** within the backlight assembly **500**. The second clips **222** are spaced apart from each other by a distance substantially equal to a distance between second light emitting portions **112** of adjacent U-shaped lamps **100**, and each of the second clips **222** is spaced apart from one of the first clips **212** adjacent to the each of the second clips **222**. That is, in an assembled condition, the first clips **212** and the second clips **222** are alternatingly arranged within the backlight assembly **500**, since the first and second light emitting portions **111**, **112** alternate within the backlight assembly **500**.

The first and second clips **212** and **222** fix the U-shaped lamps **100** relative to the first and second electrode plates **210**, **220** within the backlight assembly **500**. A first driving voltage and a second driving voltage are applied to the first and second external electrodes **120** and **130** through the first and second clips **212** and **222**, respectively.

The inverter **400** outputs the first and second driving voltages. The inverter **400** is electrically connected to the first and second electrode plates **210** and **220** through a first wire and a second wire **410** and **420**, respectively. The first driving voltage applied to the first electrode plate **210** is applied to the first external electrodes **120** through the first clips **212**, and the second driving voltage applied to the second electrode plate **220** is applied to the second external electrodes **130**

through the second clips **222**, so that the U-shaped lamps **100** emit light in response to the first and second driving voltages.

In one exemplary embodiment, the first driving voltage corresponds to a reference voltage (for example, a ground voltage), and the second driving voltage corresponds to an alternating voltage alternating with respect to the reference voltage. Alternatively, both of the first and second driving voltages may be alternating voltages having an opposite phase with each other.

The mold frame **300** has, for example, a rectangular plate, although alternate shapes of the mold frame **300** would be within the scope of these embodiments. The mold frame **300** receives the first and second electrode plates **210** and **220**. The mold frame **300** includes a dielectric material, so that the mold frame **300** electrically insulates the first and second electrode plates **210** and **220** from each other.

The mold frame **300** includes first and second combining portions **313** and **323**. The first combining portion **313** includes a first slit **311**, extending along a longitudinal direction of the mold frame **300**, for receiving the first base substrate **211**. The second combining portion **323** includes a second slit **321**, extending along a longitudinal direction of the mold frame **300**, for receiving the second base substrate **221**. The first slit **311** is formed at a first side face **310** of the mold frame **300**, and the second slit **321** is formed at a second side face **320**. The first and second side faces **310** and **320** are opposite to each other and may be parallel to each other. The first electrode plate **210** is inserted into the first slit **311** of the first combining portion **313** by sliding along the first direction D**1**, and the second electrode plate **220** is inserted into the second slit **321** of the second combining portion **323** by sliding along the second direction D**2** that is opposite to the first direction D**1**.

The first and second combining portions **313** and **323** also includes a plurality of first openings **312** and a plurality of second openings **322**, respectively. First portions of the mold frame **300**, which are disposed over the first slit **311**, may be removed to form the first openings **312**, respectively, and second portions of the mold frame **300**, which are disposed over the second slit **321**, may be removed to form the second openings **322**, respectively. Alternatively, the mold frame **300** may be manufactured without material in the areas corresponding to the first openings **312** and the second openings **322**. The first clips **212** of the first electrode plate **210** are disposed at the first openings **312**, respectively, when the first base substrate **211** is inserted into the first slit **311**, and the second clips **222** of the second electrode plate **220** are disposed at the second openings **322**, respectively, when the second base substrate **221** is inserted into the second slit **321**. In the illustrated embodiment, the clip supporting prong of each of the first and second clips **212**, **222** is received within the first and second openings **312**, **322**, respectively, and the lamp holding members of each of the first and second clips **212**, **222** extend upwardly away from the clip supporting prongs and outwardly from the first and second openings **312**, **322**, respectively.

According to these embodiments, the U-shaped lamps **100** receive the first and second driving voltages from one inverter **400** through the first and second electrode plates **210** and **220** and thus productivity is enhanced since a plurality of inverters is not required.

Furthermore, the first and second wires **410** and **420** are disposed only at the first end portions of the first and second light-emitting portions **111** and **112** of the U-shaped lamps **100**, and therefore interference between the U-shaped lamps **100** and the first and second wires **410** and **420** is reduced.

FIG. **3** is a plan view illustrating the portion of the backlight assembly in FIG. **2**.

Referring to FIG. **3**, each of the first clips **212** formed at the first electrode plate **210** is adjacent to each of the second clips **222** formed at the second electrode plate **220**. In other words, each of the first clips **212** and each of the second clips **222** alternate with each other. The first light-emitting portion **111** of the U-shaped lamp **100** is combined with the first clip **212**, and the second light-emitting portion **112** of the U-shaped lamp **100** is combined with the second clip **222**. Therefore, the first external electrode **120** formed at the first end portion of the first light-emitting portion **111** is electrically connected to the first clip **212**, and the second external electrode **130** formed at the first end portion of the second light-emitting portion **112** is electrically connected to the second clip **222**.

The first electrode plate **210** includes a first hole **211***a*. The first hole **211***a* is formed at a first end portion of the first base substrate **211**. The second electrode plate **220** includes a second hole **221***a*. The second hole **221***a* is formed at a first end portion of the second base substrate **221**. The first end portion of the first base substrate **211** and the first end portion of the second base substrate **221** may be adjacent to a first end of the mold frame **300**. The first and second wires **410** and **420** may be electrically connected to the first and second electrode plates **210** and **220** through screws (not shown) inserted into the first and second holes **211***a* and **221***a*, respectively. Thus, the wires **410** and **420** both extend and are connected to the first end of the mold frame **300**.

One of the first clips **212** is spaced apart from one of the second clips **222**, which is adjacent to the one of the first clips **212**, by a first distance d**1**. In exemplary embodiments, the first distance d**1** is in a range from about 10 mm to about 50 mm. In order to enhance luminance of the backlight assembly, reducing a distance between the first and second light-emitting portions **111** and **112** is preferable. However, when the distance between the first and second light-emitting portions **111** and **112** is less than about 10 mm, a bright line may be generated on a display screen. Therefore, in order to prevent such a bright line from occurring, the first distance d**1** is, in the exemplary embodiments described herein, in the range from about 10 mm to about 50 mm.

A second distance d**2** corresponds to a shortest distance between the first electrode plate **210** and the second electrode plate **220**. The second distance d**2** can be measured from a free end of a clip-supporting prong of the first electrode plate **210** to the second base substrate **221**. The second distance d**2** can also be measured from a free end of a clip-supporting prong of the second electrode plate **220** to the first base substrate **211**. The second distance d**2** is at least about 2 mm. When the shortest distance between the first electrode plate **210** and the second electrode plate **220** is less than about 2 mm, an interference between the first electrode plate **210** and the second electrode plate **220** is induced.

FIG. **4** is a cross-sectional view taken along line I-I' in FIG. **3**, and FIG. **5** is a cross-sectional view taken along line II-II' in FIG. **3**.

Referring to FIGS. **4** and **5**, the mold frame **300** includes a first blocking protrusion **330**. The first blocking protrusion **330** protrudes upwardly from an upper face of the mold frame **300**. The first blocking protrusion **330** blocks the first end portion of the first light-emitting portion **111** of the U-shaped lamp tube **110** to prevent the first end portion of the first light-emitting portion **111** from moving along the first direction D**1** in FIG. **1**. A height of the first blocking protrusion **330** is sufficient for preventing longitudinal movement of the first light-emitting portion **111**, and, as illustrated, may be greater than a diameter of the first light-emitting portion **111**.

The second electrode plate **220** includes a second blocking protrusion **223**. The second blocking protrusion **223** protrudes upwardly from the second base substrate **221**. The second blocking protrusion **223** blocks the first end portion of the second light-emitting portion **112** of the U-shaped lamp tube **110** to prevent the first portion of the second light-emitting portion **112** from moving along the first direction D**1** in FIG. **1**. A height of the second blocking protrusion **223** is sufficient for preventing longitudinal movement of the second light-emitting portion **112**, and, as illustrated, may be substantially equivalent to a height of a lamp holding member of the second clips **222**. In one embodiment, the second clips **222** extend from a first side of the second base substrate **221** and the second blocking protrusions **223** extend from a second side of the second base substrate **221**.

In the present embodiment, the first and second blocking protrusions **330** and **223** are formed at the mold frame **300** and the second electrode plate **210**, respectively. Alternatively, both of the first and second blocking protrusions **330** and **223** may be formed at the second electrode plate **210**. In either embodiment, both the first and second blocking protrusions **330**, **223** are positioned relative to the second side face **320** of the mold frame **300**.

The first electrode plate **210** further includes a first fixing protrusion **211***b*. A portion of the first base substrate **211** of the first electrode plate **210** is cut and bent downward to form the first fixing protrusion **211***b*. The second electrode plate **220** further includes a second fixing protrusion **221***b*. A portion of the second base substrate **221** of the second electrode plate **220** is cut and bent downward to form the second fixing protrusion **221***b*.

The mold frame **300** further includes a first fixing recession **311***a* corresponding to the first fixing protrusion **211***b*. The first fixing recession **311***a* is formed at a first face of the mold frame **300** that makes contact with the first base substrate **211** when the first electrode plate **210** is inserted into the first slit **311**. The first electrode plate **210** is fastened to the mold frame **300** due to the first fixing protrusion **211***b* and the first fixing recession **311***a*.

The mold frame **300** further includes a second fixing recession **312***a* corresponding to the second fixing protrusion **221***b*. The second fixing recession **312***a* is formed at a second face of the mold frame **300** that makes contact with the second base substrate **221** when the second electrode plate **220** is inserted into the second slit **321**. The second electrode plate **220** is fastened to the mold frame **300** due to the second fixing protrusion **221***b* and the second fixing recession **312***a*. The first and second fixing protrusions **211***b*, **221***b* may be spring biased in the protruded direction such that the fixing protrusions **211***b*, **221***b* are compressed inwardly against their bias as the first and second base substrates **211**, **221** are slid into the slits **311**, **321**, respectively, and are protruded back outwardly via spring bias as the fixing protrusions **211***b*, **221***b* are slid over the fixing recessions **211***a* and **312***a*, respectively.

While exemplary embodiments for fixing the first and second electrode plates **210**, **220** to the mold frame **300** have been described, alternate embodiments, such as, but not limited to, screws, adhesive means, etc., for fixing the first and second electrode plates **210**, **220** to the mold frame **300** would also be within the scope of these embodiments, although the illustrated embodiments allow for a simple one-step fixing process.

A shape of the first and second electrode plates **210** and **220** is not limited by FIGS. **1** through **5**. The first and second electrode plates **210** and **220** may have various shapes that would also be within the scope of these embodiments.

FIG. **6** is an exploded perspective view illustrating another exemplary embodiment of a backlight assembly according to the present invention, and FIG. **7** is a plan view illustrating a portion of the backlight assembly in FIG. **6**.

Referring to FIGS. **6** and **7**, a backlight assembly **501** includes a plurality of U-shaped lamps **101**, a first electrode plate **210**, a second electrode plate **220**, a mold frame **301**, and an inverter **400**.

Each of the U-shaped lamps **101** includes a U-shaped lamp tube **110**, a first external electrode **120**, and a second external electrode **130**. The U-shaped lamp tube **110** includes a first light-emitting portion **111**, a second light-emitting portion **112**, and a rounded portion **113**. The first and second light-emitting portions **111** and **112** extend along a first direction D**1**, and are substantially parallel with each other. The rounded portion **113** connects the first and second light-emitting portions **111** and **112** to each other, similarly to the U-shaped lamps **100** of FIG. **1**.

The first light-emitting portion **111** is shorter than the second light-emitting portion **112** by a third distance d**3**, such that a difference between a length of the second light-emitting portion **112** and a length of the first light-emitting portion **111** is equal to the third distance d**3**. In other words, the third distance d**3** is measured from a line perpendicular to the longitudinal axis of the first light-emitting portion **111** at its first end portion to a line perpendicular to the longitudinal axis of the second light-emitting portion **112** at its first end portion.

FIG. **8** is a cross-sectional view taken along line III-III' in FIG. **7**.

Referring to FIGS. **6** through **8**, the mold frame **301** of the backlight assembly **501** includes a slit **311**. The slit **311** is formed at a first side face **310**. The first electrode plate **210** is inserted into the slit **311** by sliding the first base substrate **211** in the first direction D**1**. The mold frame **301** includes an opening **312**. A portion of the mold frame **301** may be removed to form the opening **312**. Alternatively, the mold frame **301** may be manufactured to be void of material in the area of opening **312**. The opening **312** receives the first clip **212** and the first clip **212** is disposed at the opening portion **312**.

FIG. **9** is a cross-sectional view taken along line IV-IV' in FIG. **7**.

As shown in FIG. **9**, the first electrode plate **210** further includes a first fixing protrusion **211***b*. A portion of the first base substrate **211** is cut and bent downward to form the first fixing protrusion **211***b*. Additionally, the mold frame **301** includes a first fixing recession **311***a* corresponding to the first fixing protrusion **211***b*. The first fixing recession **311***a* is formed at a first surface of the mold frame **301**, which makes contact with the first base substrate **211**. When the first electrode plate **210** is inserted into the slit **311** of the mold frame **301**, the first electrode plate **210** is fastened to the mold frame **301** due to the first fixing protrusion **211***b* and the first fixing recession **311***a*.

Referring to FIGS. **6**, **7** and **9**, the second electrode plate **220** of the backlight assembly **501** is disposed on the mold frame **301**. The second electrode plate **220** is adjacent to a second side face **320** that is opposite to the first side face **310**. The mold frame **301** includes a boss **331** protruding upwardly in a direction towards the second electrode plate **220**, and the second base substrate **221** includes a connection hole **225**.

The boss **331** is inserted into the connection hole **225**, so that a portion of the boss **331** is protruded from the connection hole **225**. The protruded portion of the boss **331** may be heated and compressed in order to fasten the second base substrate **221** to the mold frame **301**. Alternatively, the boss

may be threaded or bulged and a nut or other fastening device may be secured over the second base substrate **221** onto the threaded or bulged boss. Other arrangements for fastening the second base substrate **221** onto the mold frame **301** would also be within the scope of these embodiments.

Referring to FIG. **7**, when the first end portion of the first light-emitting portion **111** is spaced apart from the first end portion of the second light-emitting portion **112** by a third distance d**3** measured along the first direction D**1**, the first base substrate **211** of the first electrode plate **210** may be spaced apart from the second base substrate **221** of the second electrode plate **220** by a fourth distance d**4** measured along the first direction D**1**. Similarly, a distance between a free end of the clip supporting prong of the clip **212** and the second base substrate **221** and a distance between a free end of the clip supporting prong of the clip **222** and the first base substrate **211** each define a distance that may be greater than the distance d**2** previously described with respect to FIG. **3**. As a result, the first and second electrode plates **210** and **220** are spaced apart, so that interference between the first and second electrode plates **210** and **220** is further reduced.

FIG. **10** is a cross-sectional view taken along line V-V' in FIG. **7**.

Referring to FIG. **10**, and with further reference to FIG. **8**, the first electrode plate **210** of the backlight assembly **501** is inserted into the slit **311** disposed at a center portion between an upper face **332** and a lower face **334** adjacent the first side face **310** of the mold frame **301**, so that the first electrode plate **210** is disposed at the center portion between the upper and lower faces **332**, **334**. On the other hand, the second electrode plate **220** is disposed on the upper face **332** of the mold frame **301**.

Therefore, the first base substrate **211** of the first electrode plate **210** and the second base substrate **221** of the second electrode plate **220** are spaced apart by a fifth distance d**5** along a vertical direction extending from the slit **311** to the upper face **332**, so that interference between the first and second electrode plates **210** and **220** is further reduced.

FIG. **11** is a plan view illustrating another exemplary embodiment of a backlight assembly according to the present invention.

Referring to FIG. **11**, a U-shaped lamp **101** of the backlight assembly includes a U-shaped lamp tube **110**, a first external electrode **120**, and a second external electrode **130**. The U-shaped lamp tube **110** generates light. Each U-shaped lamp tube **110** includes a first light-emitting portion **111**, a second light-emitting portion **112** extended in parallel with the first light-emitting portion **111**, and a rounded portion **113** connecting second end portions of the first and second light-emitting portions **111** and **112**.

The first light-emitting portion **111** is shorter than the second light-emitting portion **112**, so that the first end of the first light-emitting portion **111** and the first end of the second light-emitting portion **112** are spaced apart from each other by a third distance d**3**, where the third distance d**3** is a difference between a length of the second light-emitting portion **112** and a length of the first light-emitting portion **111**.

The first external electrode **120** covers the first end portion of the first light-emitting portion **111**. The second external electrode **130** covers the first end portion of the second light-emitting portion **112**.

The third distance d**3** in the illustrated embodiment is larger than a length L**1** of the first or second external electrode **120** or **130**. Therefore, the first and second external electrodes **120** and **130** do not overlap each other. Therefore, the first and second external electrodes **120** and **130** are sufficiently spaced apart for further reducing interference between the first and second external electrodes **120** and **130**.

FIG. **12** is an exploded perspective view illustrating another exemplary embodiment of a backlight assembly according to the present invention, and FIG. **13** is a cross-sectional view taken along line VI-VI' in FIG. **12**. The same reference numerals will be used to refer to the same or like parts in FIGS. **12** and **13** as those described in FIG. **6**, and any repetitive explanation concerning the above elements will be omitted.

Referring to FIGS. **12** and **13**, the backlight assembly **1001** includes a plurality of U-shaped lamps **101**, a first external electrode plate **210**, a second external electrode plate **220**, a mold frame **301**, an inverter **400** and a receiving container **600**.

The receiving container **600** includes a bottom plate **610** and a sidewall **620** extended from edges of the bottom plate **610** to define a receiving space for receiving the U-shaped lamps **101**, the first and second electrode plates **210** and **220**, and the mold frame **301**. The inverter **400** may be disposed at a backside of the bottom plate **610**.

The backlight assembly **1001** further includes a light-diffusing plate **710** and an optical sheet **720**. The light-diffusing plate **710** is disposed over the U-shaped lamps **101**, and the optical sheet **720** is disposed over the light-diffusing plate **710**. The light-diffusing plate **710** and the optical sheet **720** enhance luminance uniformity and viewing angle of light generated by the U-shaped lamps **101**. A distance between a center of the first light-emitting portion **111**, such as defined by its longitudinal axis, and a center of the second light-emitting portion **112**, such as defined by its longitudinal axis, is substantially equal to or less than three times a distance between the U-shaped lamps **101** and the light-diffusing plate **710**.

The backlight assembly **1001** further includes a light-reflecting plate **730**. The light-reflecting plate **730** is disposed between the U-shaped lamps **101** and the bottom plate **610** of the receiving container **600**. The light-reflecting plate **730** reflects light generated by the U-shaped lamps **101** toward the light-diffusing plate **710** to enhance light-using efficiency.

The backlight assembly **1001** further includes a first mold cover **810** and a second mold cover **820**. The first mold cover **810** covers the first end portions of the first and second light-emitting portions **111**, **112** of the U-shaped lamps **101**, and the second mold cover **820** covers the rounded portions **113** of the U-shaped lamps **101**.

FIG. **14** is a perspective view illustrating a first mold cover **810** in FIG. **12**. The second mold cover **820** in FIG. **12** is substantially identical with the first mold cover **810**, so that any repetitive explanation about the second mold cover **820** will be omitted.

Referring to FIGS. **13** and **14**, the first mold cover **810** includes an upper face **811** and an inclined face **812**. In an assembled condition, as shown in FIG. **13**, the upper face **811** may rest upon a sidewall **620** of the receiving container **600**, and the inclined face **812** may extend towards the bottom plate **610** of the receiving container **600**. The upper face **811** is substantially parallel with the bottom plate **610** of the receiving container **600**. The inclined face **812** is downwardly extended from the upper face **811** such that a vertical angle between the upper face **811** and the inclined face **812** is obtuse. The inclined face **812** includes a plurality of receiving holes **812***a* for receiving the U-shaped lamps **101**. The first mold cover **810** covers an ineffective light-emitting region of the U-shaped lamps **101**, and therefore does not interfere with light transmittance.

The upper face **811** of the first mold cover **810** includes a stepped portion **811***a* for guiding a position of the light-diffusing plate **710** and the optical sheet **720**. The inclined face **812** extends from an end of the stepped portion **811***a*.

Referring again to FIG. **12**, the backlight assembly **1001** further includes a plurality of fixing members **900**. The fixing members **900** will be further explained below with reference to FIGS. **15** and **16**.

The backlight assembly **1001** further includes a plurality of sensors **430** and a circuit board **440**. The sensors **430** and the circuit board **440** will be further explained below with reference to FIG. **17**.

FIG. **15** is a perspective view illustrating a fixing member **900** in FIG. **12**, and FIG. **16** is a cross-sectional view taken along line VII-VII' in FIG. **15**.

Referring to FIGS. **15** and **16**, each of the fixing members **900** includes a supporting portion **910** for supporting the U-shaped lamps **100** or **101** and a fixing portion **920** for fastening the fixing member **900** to the light-reflecting plate **730** and the bottom plate **610** of the receiving container **600**. The supporting portion **910** includes an opening **911** having a diameter w**1**, and a channel **912** having a width w**2**. The rounded portion **113** of the U-shaped lamp **100** is inserted into the opening **911** through the channel **912**. The diameter w**1** of the opening **911** is substantially same as a diameter of the round portion **113** of the U-shaped lamp tube **110**, and the width w**2** of the channel **912** is smaller than the diameter w**1** of the opening **911**.

When the rounded portion **113** of the U-shaped lamp tube **110** is inserted into the opening **911** through the channel **912**, the U-shaped lamp tube **110** of the U-shaped lamps **100** or **101** is fastened to the supporting portion **910**.

The supporting portion **910** includes an elastic material, so that when the rounded portion **113** of the U-shaped lamp tube **110** passes through the channel **912**, the channel **912** dehisces. In other words, the channel **912** expands such that the width w**2** increases for allowing passage of the rounded portion **113** there through. The channel **912** may contract, and thus the width w**2** may return to its prior width, after the rounded portion **113** is seated within the opening **911**.

The supporting portion **910** protrudes from the fixing portion **920**. The fixing portion **920** is inserted into the first and second through holes **731** and **611** formed at the light-reflecting plate **730** and the receiving container **600**, respectively. The fixing portion **920** may include a flat stabilizing portion for lying substantially flush with a surface of the receiving container **600** and an attachment prong extending downwardly, in an opposite direction of the supporting portion **910**, from the flat stabilizing portion. Alternatively, the fixing portion **920** may include only the attachment prong. A diameter of attachment prong of the fixing portion **920** is slightly greater than a diameter of the first and second through holes **731** and **611**, so that the fixing portion **920** is tightly fastened to the light-reflecting plate **730** and the receiving container **600**. While an exemplary attachment arrangement is illustrated and described, other means and devices for attaching the fixing portion **920** to the receiving container **600** would be within the scope of these embodiments.

The fixing member **900** may have various shapes, and is therefore not limited to the illustrated embodiment, but instead may be designed to best accommodate various lamp tube designs and backlight assemblies.

FIG. **17** is a plan view illustrating a connection between a sensor and a U-shaped lamp.

Referring to FIG. **17**, the first and second light-emitting portions **111** and **112** of the U-shaped lamps **100** are extended along a third direction D**3**, and the circuit board **440** is disposed such that a longitudinal direction of the circuit board **440** is substantially parallel with a fourth direction D**4** that is substantially perpendicular to the third direction D**3**. Alternatively, such a circuit board **440** and sensors **430** may be arranged relative to U-shaped lamps **101**. Sensors **430** are disposed upon the circuit board **440**.

Each of the sensors **430** has an electrically conductive plate shape. The sensors **430** face the first light-emitting portion **111** or the second light-emitting portion **112**. The sensors **430** sense currents induced by electromagnetic waves generated from the U-shaped lamps **100** to output a sensing signal.

The circuit board **440** is electrically connected to the inverter **400** in FIG. **12** to apply the outputted sensing signal to the inverter **400**.

The inverter **400** controls the U-shaped lamps **100**, or alternatively U-shaped lamps **101**, based on the outputted sensing signal. When one of the U-shaped lamps **100** or **101** is abnormal, the inverter **400** cuts off driving voltage applied to the U-shaped lamps **100** or **101** to stop operation in order to protect the U-shaped lamps **100** or **101** from being damaged.

FIG. **18** is an exploded perspective view illustrating an exemplary embodiment of an LCD device according to the present invention.

Referring to FIG. **18**, an LCD device **1401** includes a backlight assembly **1001** and a display unit **1100**.

The display unit **1100** includes an LCD panel **1110**, a data printed circuit board ("data PCB") **1120**, a gate printed circuit board ("gate PCB") **1130**, a data flexible printed circuit ("data FPC") **1140** and a gate flexible printed circuit ("gate FPC") **1150**. The data and gate PCBs **1120** and **1130** are electrically connected to the LCD panel **1110** through the data and gate FPCs **1140** and **1150**, respectively. The data and gate FPCs **1140** and **1150** include a data driver chip **1142** and a gate driver chip **1152**, respectively, for converting control signals provided from an external device into driving signal.

The LCD panel **1110** includes a thin film transistor ("TFT") substrate **1112**, a color filter substrate **1114** facing the TFT substrate **1112**, and a liquid crystal layer **1116** disposed between the TFT substrate **1112** and the color filter substrate **1114**.

The TFT substrate **1112** includes a glass substrate and a plurality of TFTs (not shown) formed on the glass substrate. The TFTs are arranged in a matrix shape. Each of the TFTs includes a source electrode that is electrically connected to one of a plurality of source lines, a gate electrode that is electrically connected to one of a plurality of gate lines, and a drain electrode that is electrically connected to one of a plurality of pixel electrodes (not shown). Each pixel electrode includes an optically transparent and electrically conductive material.

The color filter substrate **1114** includes a glass substrate, a plurality of color filters (not shown) having red-color filters, green-color filters and blue-color filters, and a common electrode (not shown) having an optically transparent and electrically conductive material.

The LCD device **1401** further includes a top chassis **1200** and a guide frame **1300**. The top chassis **1200** surrounds edge portions of the LCD panel **1110** and combines with the receiving container **600** to fasten the LCD panel **1110** to the backlight assembly **1001**. The top chassis **1200** protects the LCD panel **1110** and prevents the LCD panel **1110** from drifting.

The guide frame **1300** is disposed between the backlight assembly **1001** and the LCD panel **1110** to fix the light-diffusing plate **710** and the optical sheet **720**. Additionally, the guide frame **1300** guides a position of the LCD panel **1110**.

According to the above-described embodiments and their alternatives, the backlight assembly employs only one inverter for driving a plurality of U-shaped lamps electrically connected in parallel to enhance productivity.

Furthermore, the first and second wires for connecting the U-shaped lamp to the inverter are disposed at one side of the backlight assembly, so that interference between the wires and the U-shaped lamp is reduced.

Having described the exemplary embodiments of the present invention and its advantages, it is noted that various changes, substitutions and alterations can be made herein without departing from the spirit and scope of the invention as defined by appended claims. Moreover, the use of the terms first, second, etc. do not denote any order or importance, but rather the terms first, second, etc. are used to distinguish one element from another. Furthermore, the use of the terms a, an, etc. do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced item.

What is claimed is:

1. A backlight assembly comprising:

a plurality of U-shaped lamps, each of the plurality of U-shaped lamps including a U-shaped lamp tube, a first external electrode covering a first end portion of the U-shaped lamp tube, and a second external electrode covering a second end portion of the U-shaped lamp tube, the U-shaped lamp tube generating light when a first driving voltage is applied to the first external electrode and a second driving voltage is applied to the second external electrode, the first and second end portions of the U-shaped lamp tubes disposed at one end of the plurality of U-shaped lamps;

a first connecting member electrically connected to each first external electrode of the plurality of U-shaped lamps to apply the first driving voltage to each first external electrode;

a second connecting member electrically connected to each second external electrode of the plurality of U-shaped lamps to apply the second driving voltage to each second external electrode;

a mold frame receiving the first and second connecting members, and disposing the first and second connecting members at the first end portions and the second end portions of the plurality of U-shaped lamps, respectively; and

a receiving container receiving the plurality of U-shaped lamps and the mold frame;

wherein an entirety of the mold frame is disposed at the one end portion of the plurality of U-shaped lamps.

2. The backlight assembly of claim **1**, wherein the first connecting member comprises:

a first base substrate, wherein the first base substrate is electrically conductive to receive the first driving voltage; and

at least one first clip protruding from the first base substrate to combine with the first end portion of each U-shaped lamp tube to apply the first driving voltage to each first external electrode, and,

wherein the second connecting member comprises:

a second base substrate, wherein the second base substrate is electrically conductive to receive the second driving voltage; and

at least one second clip protruding from the second base substrate to combine with the second end portion of each U-shaped lamp tube to apply the second driving voltage to each second external electrode.

3. The backlight assembly of claim **2**, wherein the second connecting member further comprises at least one blocking protrusion that prevents the at least one U-shaped lamp from moving along a longitudinal direction of the at least one U-shaped lamp.

4. The backlight assembly of claim **2**, wherein the first and second clips are alternatingly arranged within the backlight assembly, and a distance between one of the at least one first clip and an adjacent one of the at least one second clip is in a range from about 10 mm to about 50 mm.

5. The backlight assembly of claim **2**, wherein each U-shaped lamp tube comprises:

a first light-emitting portion;

a second light-emitting portion extending substantially parallel with the first light-emitting portion, a length of the second light-emitting portion longer than a length of the first light-emitting portion; and

a rounded portion connecting the first and second light-emitting portions.

6. The backlight assembly of claim **5**, further comprising a mold frame receiving the first and second connecting members, the mold frame having a slit formed at a first side face for slidably receiving the first base substrate.

7. The backlight assembly of claim **6**, wherein the mold frame further comprises at least one opening receiving the at least one first clip.

8. The backlight assembly of claim **6**, wherein the first connecting member further comprises a fixing protrusion protruding downwardly from the first base substrate, and wherein the mold frame further comprises a fixing recession receiving the fixing protrusion to fasten the first connecting member to the mold frame.

9. The backlight assembly of claim **6**, wherein the second connecting member is disposed on an upper face of the mold frame and disposed adjacent to a second side face of the mold frame, wherein the second side face of the mold frame is opposite to the first side face of the mold frame.

10. The backlight assembly of claim **9**, wherein the mold frame further comprises a boss protruding upwardly from the upper face of the mold frame, and wherein the second base substrate of the second connecting member comprises a connection hole receiving the boss, and further wherein the boss is heated and compressed to fasten the second connecting member to the mold frame.

11. The backlight assembly of claim **5**, wherein a difference between the length of the second light-emitting portion and the length of the first light-emitting portion is larger than a length of each of the first and second external electrodes.

12. The backlight assembly of claim **1**, wherein the mold frame comprises a dielectric material, and wherein the mold frame has a first combining portion and a second combining portion for receiving the first and second connecting members, respectively.

13. The backlight assembly of claim **12**, wherein the first combining portion includes a first slit, wherein the first connecting portion is slidably inserted into the first slit, and wherein the second combining portion includes a second slit, wherein the second connecting portion is slidably inserted into the second slit.

14. The backlight assembly of claim **13**, wherein the first slit is formed at a first side face of the mold frame, the second slit is formed at a second side face of the mold frame, and the first and second slits are opposite to each other.

15. The backlight assembly of claim **14**, wherein the mold frame comprises at least one first opening portion for receiving the at least one first clip of the first connecting member, and wherein the mold frame further comprises at least one second opening portion for receiving the at least one second clip of the second connecting member.

16. The backlight assembly of claim 1, wherein the first and second connecting members comprise a first fixing protrusion and a second fixing protrusion protruded from the first and second base substrates, respectively, and wherein the mold frame further comprises a first fixing recession and a second fixing recession receiving the first and second fixing protrusions, respectively, to fasten the first and second base substrates to the mold frame.

17. The backlight assembly of claim 1, wherein the mold frame further comprises at least one blocking protrusion that prevents the at least one U-shaped lamp from moving along a longitudinal direction of the at least one U-shaped lamp.

18. The backlight assembly of claim 1, wherein the first and second connecting members are substantially parallel with each other, and wherein the first and second connecting members are spaced apart from each other by at least about 2 mm.

19. The backlight assembly of claim 1, wherein each U-shaped lamp tube comprises:

a first light-emitting portion;

a second light-emitting portion extending substantially parallel to the first light emitting portion; and

a rounded portion connecting the first and second light-emitting portions.

20. The backlight assembly of claim 19, further comprising at least one fixing member combined with the rounded portion of each U-shaped lamp to fix each U-shaped lamp within the backlight assembly.

21. The backlight assembly of claim 19, further comprising a light-diffusing plate that diffuses light generated from the at least one U-shaped lamp, and wherein a distance between a central longitudinal axis of the first light-emitting portion and a central longitudinal axis of the second light-emitting portion is substantially equal to or less than three times a distance between the at least one U-shaped lamp and the light-diffusing plate.

22. The backlight assembly of claim 19, further comprising:

a first mold cover that covers the first and second end portions of the at least one U-shaped lamp; and

a second mold cover that covers the rounded portion of the at least one U-shaped lamp.

23. The backlight assembly of claim 1, wherein the first driving voltage is a reference voltage and the second driving voltage is an alternating voltage alternating with respect to the reference voltage.

24. The backlight assembly of claim 1, wherein the first and second driving voltages are alternating voltages having opposite phases with each other.

25. A display device comprising:

a display panel that displays an image by using light; and

a backlight assembly that provides the display panel with the light, the backlight assembly comprising:

a plurality of U-shaped lamps, each of the plurality of U-shaped lamps including a U-shaped lamp tube, a first external electrode covering a first end portion of the U-shaped lamp tube, and a second external electrode covering a second end portion of the U-shaped lamp tube, the U-shaped lamp tube generating light when a first driving voltage is applied to the first external electrode and a second driving voltage is applied to the second external electrode, the first and second end portions of the U-shaped lamp tubes being disposed at one end of the plurality of U-shaped lamps;

a first connecting member electrically connected to each first external electrode of the plurality of U-shaped lamps to apply the first driving voltage to the first external electrode;

a second connecting member electrically connected to each second external electrode of the plurality of U-shaped lamps to apply the second driving voltage to the second external electrode; and

a mold frame receiving the first and second connecting members, and disposing the first and second connecting members at the first end portions and the second end portions of the plurality of U-shaped lamps, respectively; and

a receiving container receiving the plurality of U-shaped lamps and the mold frame;

wherein an entirety of the mold frame is disposed at the one end portion of the plurality of U-shaped lamps.

26. The display device of claim 25, wherein the first connecting member comprises:

a first base substrate, wherein the first base substrate is electrically conductive to receive the first driving voltage; and

at least one first clip protruding from the first base substrate to combine with the first end portion of each U-shaped lamp tube to apply the first driving voltage to each first external electrode, and wherein the second connecting member comprises:

a second base substrate, wherein the second base substrate is electrically conductive to receive the second driving voltage; and

at least one second clip protruding from the second base substrate to combine with the second end portion of each U-shaped lamp tube to apply the second driving voltage to each second external electrode.

27. The display device of claim 26, wherein the mold frame comprises a dielectric material.

28. The display device of claim 25, wherein each U-shaped lamp tube comprises:

a first light-emitting portion;

a second light-emitting portion extending substantially parallel with the first light-emitting portion, a length of the second light-emitting portion longer than a length of the first light-emitting portion; and

a rounded portion connecting the first and second light-emitting portions.

29. The display device of claim 25, further comprising:

a receiving container that receives the backlight assembly and the display panel; and

a top chassis that surrounds an edge portion of the display panel and combines with the receiving container to fasten the display panel to the receiving container.

30. The display device of claim 29, further comprising an inverter that applies the first and second driving voltages to the first and second external electrodes, respectively, wherein the inverter is disposed at a backside of the receiving container.

31. A backlight assembly comprising:

a plurality of U-shaped lamps, each of the plurality of U-shaped lamps including a first end portion and a second end portion;

a first single connecting member electrically connected to each of the first end portions of the plurality of U-shaped lamps, and a second single connecting member electrically connected to each of the second end portions of the plurality of U-shaped lamps;

a mold frame receiving the first and second single connecting members, and disposing the first and second single

connecting members at the first end portions and the second end portions of the plurality of U-shaped lamps, respectively;

a single inverter electrically connected to the plurality of U-shaped lamps; and

a receiving container receiving the plurality of U-shaped lamps and the mold frame,

wherein the inverter provides first and second driving voltages to each lamp within the plurality of U-shaped lamps, the first end portions and the second end portions are disposed at one end of the plurality of U-shaped lamps, and an entirety of the mold frame is disposed at the one end of the plurality of U-shaped lamps.

32. The backlight assembly of claim **31**, having an upper surface for emitting light from the backlight assembly, and an opposite lower surface, the backlight assembly further having a plurality of sides, each lamp in the plurality of lamps having a first external electrode and a second external electrode, wherein the first external electrode and the second external electrode are positioned adjacent a first side in the plurality of sides of the backlight assembly.

33. The backlight assembly of claim **32**, wherein first and second wires extending from the inverter both extend towards the first side of the backlight assembly.

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